SCHOOL DISTRICT EFFICIENCY AS MEASURED BY THE FINANCIAL ALLOCATION STUDY OF TEXAS

A Record of Study

By

RYAN DAVID STEELE

Submitted to the Office of Graduate and Professional Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF EDUCATION

Chair of Committee,	Jim Scheurich
Committee Members,	Judy Sandlin
	Lori Taylor
	Mario Torres
Head of Department,	Frederick Nafukho

December 2013

Major Subject: Education Administration

ABSTRACT

The purpose of this record of study was to analyze efficiency in Texas public schools through the use of the Financial Allocation Study of Texas (FAST). A quantitative analysis of the FAST was conducted using ordered logistic regressions as a means of determining which factors contribute to the efficiency. Data from the three years of the FAST were used in the analysis. The biggest predictor of efficiency in the FAST was the percent of students who were economically disadvantaged. Additionally, it was found that larger districts are more efficient than smaller districts. Efficient districts spend less overall per pupil in 9 of the 15 functions of spending reported by schools and spend less on a variety of programs, including regular education, special education, and athletics/cocurricular spending. However, it was found that spending in the area of bilingual/ESL increased efficiency. It was also found that districts with high property wealth were less efficient overall and that the student/teacher ratio and teacher experience was negatively correlated with efficiency. The implications of this research include the need for districts wishing to become more efficient to increase the class size of classrooms and focus spending on improving the achievement of economically disadvantaged students. In addition, districts should focus resources on campus level administrators rather than instructional or curriculum specialists.

DEDICATION

There are many people who contributed to the completion of study. First and foremost, I want to thank my wife, Holly, for allowing me spend the time and energy required to complete this monumental task. I could not have done it without her love and support, and this accomplishment is as much a testament to her perseverance and dedication as it is to mine. I do not deserve a woman as loving as supportive as her. She is the best wife and mother a person can have.

I also wish to thank my children Tyler, Landry, and Georgia Kate for inspiring me to be a better man and a better father every day. Tyler was not yet a year old when I started on this journey, and it amazes me to think of how much he has grown since I began. Georgia Kate entered our family well into the process, but she has reminded me how precious life is and how each moment should be cherished. Finally, Landry, who showed more strength and determination in the 43 hours of his short life than I will show in my entire lifetime. He has left a legacy behind that gives me more pride than I can express.

I also want to thank my family which has supported me along the way. My parents, Roy and Linda, I want to thank my in-laws, Jim and Georgia Vaughn, who support Holly, the kids, and me in all we do and always provide us with great, free baby-sitting. Finally, I wish to dedicate this accomplishment to my late cousin, Vernon Newsom. Vernon is the one who first motivated me to get into school administration and complete both my master's and doctoral degrees.

ACKNOWLEDGEMENTS

There are a great number of people who have assisted me as I have worked completed my degree. I wish to acknowledge the staff and faculty of the Education Administration and Human Resources department at Texas A&M University. The faculty challenged my beliefs and changed my worldview as to what it means to be equitable, fair, and just both in the classroom and in the world. I would like to thank them for taking on the challenge and task of trying to change the world by changing educational leaders. I must acknowledge Dr. Anthony Rolle for his willingness to initially chair my committee and for teaching me both the statistics and ethics necessary to serve as an educational leader. I want to thank Dr. Jim Scheurich for being willing to chair my committee even though he is a qualitative person in my quantitative world. His knowledge of school leadership and of underrepresented student groups is extensive, and I am humbled that he has been willing to work with me throughout this process. I wish to thank both Dr. Mario Torres and Dr. Judy Sandlin for their willingness to serve on my committee and their dedication to educational and social justice.

Finally, I would like to acknowledge Dr. Lori Taylor for helping this statistically challenged student through the wonderful—and sometimes mind-numbing—world of quantitative analysis. Dr. Taylor is a wonderful researcher and person, and she exhibited tremendous patience with me. She was always willing to provide assistance and critique, and I would not have been able to complete this study without her dedication. I believe that I truly learned under the guidance of a master in Dr. Taylor, and I will forever be grateful.

I am also certain that I would not be here today without the help and encouragement of my cohort group at Texas A&M. We experienced both triumph and tragedy together and became a family along the way. My experience would not have been the same without you. To Jerrod and Grady, thank you for being my travel buddies who were always there for me. I will never forget our car rides, hotel stays, and the fun we had together. Thank you to Tina/Augustina for challenging my perceptions on race and equality and for always lending me a critical eye and ear. She was always the yin to my yang in classes, and she certainly is the best of us. Thank you to Dr. Reynolds for providing comic relief and showing me that if you can finish, anyone can. Thank you to Dr. Lowry, Carlotta, Pam, Jeff, Jason, Nikisha, and the others who helped both each other and me on this long and strange trip. I am now and will always be there for you!

TABLE OF CONTENTS

CHAPTER Page

Page

LIST OF FIGURES

Page

LIST OF TABLES

Page

Page

Page

Page

CHAPTER I

INTRODUCTION

The financing of public schools has long been a hotly debated topic and remains as complex an issue today as when it began. At a time when 48 of 50 states are proposing cuts in their budgets (Leachman, Williams, & Johnson, 2011), state legislators in Texas are looking any and everywhere to find ways to cut costs, including public education. These budget cuts come at the same time as state assessments on student achievement become more rigorous (Ball & Goldman, 1997; Equity Center, 2010). As a result, school districts are asked to find ways to be more efficient in their operations in order to increase student achievement with less funding. School districts which are able to operate efficiently will serve as valuable examples for other districts (Financial Allocation Study of Texas, 2010).

In order to examine the cost-effectiveness of Texas public schools, the 81st Texas Legislative session passed House Bill 3 (HB3) which directed the State Comptroller of Texas to "identify school districts and campuses that use resource allocation practices that contribute to high academic achievement and cost-effective operations." The result of this mandate is known as the Financial Allocation Study of Texas (FAST), which examines the relationship between resource allocation and student achievement in a way that no other study ever has. By using the FAST as a framework to study efficiency, Texas educators and law makers are able to compare both school districts and campuses to determine which get the biggest bang for their buck.

For public schools in Texas to become more efficient, it is important to know which schools are rated as highly efficient and to examine what those schools do in order to be rated as efficient. Therefore, this study intends to explore what the trends are for district resource allocation across the 5 different ratings of the FAST in order make recommendations for schools to become more efficient.

Statement of the Problem

Despite roughly 40 years of litigation and reform, Texas continues to struggle with the creation of a funding mechanism which meets the requirements of Article 7, Section 1, of the Texas Constitution, which states: "it shall be the duty of the Legislature of the State to establish and make suitable provision for the support and maintenance of an efficient system of public free schools." The long history of legal challenges in Texas has resulted in both major and minor changes in the funding mechanism (Imazecki & Reschovsky, 2006). While this funding mechanism has often included triggers intended to create wealth neutrality (Imazecki & Reschovsky, 2004) or equalize revenue between property rich and property poor districts (Imazeki & Reschovsky, 2006), the continued efforts to reform school finance in Texas speaks to the persistent failure of the funding mechanism to accomplish its goals. One of the causes for the seemingly endless effort the state governments—both in Texas and across the nation—to reform public school finance is that "states frequently rely on lawyers rather than economists, so that the mechanisms are manifestations of the legal rhetoric of equalizations rather than the economic logic about taxation and redistribution" (Hoxby, 2001, p. 1190). Hoxby continues to argue that the results of this type of planning is that funding mechanisms often fail to produce their desired results and end up as trial-and-error systems of school finance.

Highlighting the need for efficiency in schools are several factors which negatively impact the current state of school finance in Texas. The first factor which negatively impacts school finance in Texas is a structural deficit in tax revenue for public schools created by House Bill 1 (HB1) in the 3rd called special session of the 79th Texas Legislature in 2006. As explained by State Representative Jim Dunnam, (2009):

> In a special session in 2006, the Texas Legislature cut property taxes by $14.2 billion and passed a revenue package, including a revised franchise tax, to help pay for the cuts. The revised franchise tax is estimated to produce substantially less than projected, and the “revenue neutral tax swap” passed in 2006 is now projected to create a gap in excess of $8 billion in the budget. This structural deficit is said to be regardless of the economic downturn; that is, it is “structural” within our Texas tax system, and cannot be cured without major overhaul. (9)

This structural deficit creates, and will continue to create in the future, the need for Texas public schools to be more efficient in their operations due to the continued shortfall in revenues that will occur in the foreseeable future.

Another factor which negatively impacts school districts is the fact that, in addition to the revenue shortfall created by the tax structure, the population of students in Texas continues to grow at rapid pace, especially low-income, Latino students

(Murphy, 2003). This trend is especially concerning because poor districts, who are largely composed of students of color, are often the ones most detrimentally affected by legislative appropriation (Alemán, 2006). Because the population of students is growing, school districts must hire new faculty, provide more instructional materials, and build facilities in order to keep up with the growth.

Another contributor which exacerbates the budget shortfall in Texas public schools is the current trend of the depletion of local fund balances in order to avoid budget deficits. According to the Equity Center (2010), in 2007-08 and 2008-09 approximately "40% of Texas districts spent more than $1.1 billion from their [local] fund balances in order to avoid budget deficits" (42). The Texas Associations of School Boards (2011) notes that over 50% of school districts used fund balance in 2009-2010 to balance their budgets. Fund balances are designed to serve as a means to cover cash flow deficits and to create a financial cushion to meet unexpected expenses and emergencies. As these fund balances are depleted, it will become impossible for school districts to cover the shortfalls in their budgets.

While State Representative Dunnam (2009) spoke of the roughly $8 billion deficit that the Texas Legislature would have to address during the 2010-2011 fiscal biennium, his concern for the structural deficit seems almost prophetic because today the state of Texas faces a $27 billion dollar shortfall in revenue for the 2012-2013 biennium (Texas Comptroller of Public Accounts, 2011). According to Harrison (2010), this shortfall can be attributed to a nearly $2 billion shortfall in sales tax, the population growth in Texas, and the use of approximately $6 billion in Federal stimulus funds that were used in 2009-2010 to balance the budget. At this point, it is unknown whether the changes made in the 83rd Texas Legislative session will adequately address the funding concerns of public school advocates, the continued threat of budget shortfalls due to the structural deficit make paramount the need for efficiency in public schools amongst educational leaders in Texas.

All of these factors play an important role in the need for Texas school districts to become more efficient. However, the multitude of methods used by scholars and researchers to study school finance can result in vast differences in the findings of the researchers (Gronberg, Jansen, & Taylor, 2011), which might hinder the ability of educational leaders to know how to become more efficient. Though some (Hanushek, 2005) cite a multitude of problems relating to the ambiguity of terms and the interpretive issues in students, as well as the fact that these studies are funded by special interest advocacy groups, as the source of such discrepancies, others (Duncombe, 2006) simply believe that such studies must refine their methods in order to increase interrater reliability and validity. Whatever the cause of the inconsistency in research studies, it is important for researchers to use a framework which will help educational leaders make decisions to increase their efficiency.

Purpose of the Study

With the advent of the Financial Allocation Study of Texas (FAST), educational leaders in Texas now have a framework with which to view efficiency in Texas school districts and campuses. As part of its design, the FAST rated each school district and campus in Texas in their ability to produce academic gains in achievement in relation to their economic expenditures, i.e. schools with high academic achievement with low expenditures were rated higher than schools which produced the same level of achievement with high expenditures. As such, the purpose of this record of study is to use the FAST as a lens through which to study efficiency in Texas in order to determine which aspects of school spending produce the most efficient schools.

It is the objective of this study to identify several spending patterns within districts which might serve as a predictor for efficiency. First of all, this study seeks to identify spending patterns across each of the 5 rating levels in the FAST which contributed to the school district receiving its current rating. In order for educational leaders to better understand how their district earned its rating, it would be beneficial to them to see the spending patterns of districts at each of the 5 rating levels. Second, this study will attempt to determine whether a district's resource allocation can be used as a predictive measure in its rating according to the FAST. By identifying the trends in spending across the district level, it becomes easier for educational leaders to focus their spending on areas which produce the greatest efficiency.

Next, this study will compare efficient districts with less efficient district in regards to their resource allocation. While some of the spending patterns may be the same across several rating levels, a comparison of efficient versus inefficient districts will enable educational leaders to better evaluate how their spending compares to other, more efficient districts.

Research Questions

The following research questions were established in order to fulfill the purpose of this study:

1. Based on the FAST study, what are the spending patterns of school districts at each of the 5 rating levels of the FAST?
2. Does the district's allocation of resources predict the district's efficiency as measured by the FAST?
3. How do efficient districts compare in their resource allocation across the function and program versus less efficient districts?
4. Do other factors—district size, property wealth, administrative costs, teacher experience, student/teacher ratio, cocurricular spending—explain differences in the FAST measure of efficiency?

Significance of the Study

This study is significant because it is the first to use the FAST as a framework for studying efficiency in schools in Texas. As noted previously, researchers have used many different types of methodologies to study school efficiency, yet to this point "there is a lack of an established 'consensus' theory from which appropriate models can be constructed" (Vignoles et. al., 2000). Due to the fact that the FAST was created by the State Comptroller of Texas as a response to a legislative mandate and the fact that FAST is a highly publicized study which rates every district and campus in Texas, it is important for practicing administrators in Texas public schools to develop a greater understanding of the efficiency patterns shown by the FAST data. As important, the data used in the FAST is used to evaluate both campus and district level spending. While this study will not attempt to evaluate the spending patterns at the campus level (See **Limitations of the Study**), it is hoped that this study will provide insight as to how efficient districts use their district resource allocation to increase their efficiency. Again, this information is significant for practicing school administrators because they will be able to use the examples set by efficient districts to pattern the spending in their own districts.

Limitations of the Study

When conducting a research study, it is important for the researcher to consider any limitations that might be inherent to the study and address those limitations. To begin, this study will not attempt to complete analyses of expenditures at the campus level data. As the FAST (2010) notes, financial reporting to the Texas Education Agency varies by district. Districts can choose to allocate certain expenditures, i.e. multi-campus teachers, to specific campuses while others do not. This is also true with the campus level coding of expenditures. While one campus might code an expense as instruction, another campus might code the same expense as student support services. The coding of expenditures varies from district-to-district and even campus-to-campus within a district. Therefore, it is impossible to be able to truly analyze campus level expenditures to determine which expenditures have a predictive value.

Another limitation in this study is in how the FAST study measures the expenditures of districts which might serve as the fiscal agent for inter-district cooperatives. For example, many small or rural districts participate in a special education cooperative or transportation to share and reduce the cost of these services in their budget. While there is an assumption that each district pays for their own costs associated with these services, the fiscal agent must report the cost of the cooperative as part of their local expenses, therefore artificially inflating the expenditures of the districts. Despite attempts by the researchers involved with the FAST study, during the first year of the study there was no practical way to account for what was a true expenditure of the district versus what was expenditure for the cooperative. Where expenditures could not be attributed to an individual member district of the cooperative, those costs were automatically accrued to the fiscal agent. During the final two years of the study, researchers were able to differentiate between cooperative costs and individual member district costs but were dependent on the fiscal agent of the cooperative to accurately report cooperative expenditures.

Definition of Terms

Adequacy – The amount of money that a school must spend to achieve a given level of student performance (Reschovsky & Imazeki, 1997).

Efficiency – Efficiency in schools is generally defined as either a production efficiency measure—the maximum amount of output that can be produced from a given quantity of inputs (Schwartz & Stiefel, 2001)—or as a cost efficiency measure—the minimum amount of inputs needed to produce a given quantity of output (Haelermans, De Witte, & Blank, 2012). For the purpose of this study, efficiency will be defined as the cost efficiency of school districts and charter schools.

Equity – The concept that one district or school receives the same or similar amounts of revenue as another, usually in the same district or state (Clune, 1994).

Organization of the Study

Chapter I presents an overview of the record of study. Chapter I underscores the need for the study, provides the purpose, and gives the research questions to be addressed. Chapter II provides a review of the current literature, beginning with the history of finance litigation in Texas and the evolution of school finance from equity to adequacy to efficiency. Chapter II continues by describing the methodology and the justification for the use of the Financial Allocation Study of Texas (FAST) as a framework for studying school efficiency. Chapter III provides a description of the methods used in the study. Chapter IV contains the findings of the research study. Finally, Chapter V provides a summary of the research and offers recommendations and implications for future studies.

CHAPTER II

REVIEW OF LITERATURE

Introduction

Chapter II contains a brief review of the literature regarding school finance in Texas and school finance efficiency. The chapter begins with a brief history of school finance in Texas and how litigation and court rulings have changed the funding mechanism through the years. Following the review of Texas school finance cases, there will be a summary of current literature regarding the concept of school efficiency, including an explanation of how efficiency is measured and the importance of being efficient in expenditures. There will be a review of the Financial Allocation Study of Texas (FAST) which will include an overview of its methodology and the justification for its use as a framework for studying efficiency in Texas. Finally, a review of the current research regarding the best practices for school efficiency.

History of School Funding and Litigation in Texas

The first significant law to create school funding reform in Texas was known as the Gilmer-Aikens Act of 1949 (Alemán, 2007; Kuehlem, 2004; San Antonio v. Rodriguez, 1973). Prior to this act, school districts were almost entirely dependent on local property taxation to generate revenue and received very little, if any, funds from the state for public education. Seizing upon the economic boon and changing demographics that followed World War II and the Baby Boom Generation, the Texas legislature took the unprecedented step of scrutinizing public schools and making major educational reforms, including studying the efficiency of public school finance. As a result of Gilmer-Aikins, several reforms were made, including:

1. Transforming the State Department of Education to the Texas Education Agency (TEA), which enabled the state to guide the development of a more effective educational program while maintaining local control
2. Changing the State School Board from a 9 member panel appointed by the governor to a 21 member panel elected by popular vote
3. Created a State Commissioner of Education who was appointed by the State Board of Education
4. Developed a new Minimum Foundation Program of school funding to assist the low economic areas to maintain a higher standard of school services and funded schools based on their Average Daily Attendance (ADA)
5. Established minimum standards for teacher education and certification, requiring all high school teachers to have a baccalaureate degree
6. Set a minimum salary scale for teachers

Coupled with the National Defense of Education Act of 1958, a response to the Soviet threat after the launching of Sputnik I, the Gilmer-Aikins Act opened the door for the increased role of state dollars into the public education funding system and helped shape the current system of funding in Texas.

Despite its measures to for equity and its attempt to increase efficiency, the Gilmer-Aikins Act was unable to fundamentally change the way schools were funded (Alemán, 2007; Walker & Casey, 1996). According to Alemán (2007), "districts continued to generate school operational and maintenance funds primarily through local property taxes. The state system was ‘unequalized’ and the varied property values across the state resulted in wide disparities in local school funding” (p. 534). Hardest hit among districts were those which had student population that was majority-Mexican American. Despite recommendations from several statewide commissions appointed by the governor to include a method to equalize funding, the state legislature refused to act. The failure to act by the legislature left those wishing to see meaningful changes in the school funding mechanism little choice but to pursue legal action in hopes of initiating change.

San Antonio ISD vs. Rodriguez

While there have been numerous cases, two of the earliest and most influential lawsuits are San Antonio ISD v. Rodriguez, filed in 1969, and a series of lawsuits collectively known as Edgewood v. Kirby, which was originally filed in 1984 (Dawn, 1999; Walsh, Kimerer, & Manitis, 2005). San Antonio ISD v. Rodriguez was a federal case where plaintiffs argued that the system of educational finance in Texas was in violation of the equal protection clause of the Fourteenth Amendment. Incidentally, Valencia (2002) notes that the Rodriguez case was “unique in that it is the first, and only, case of school finance equity to be adjudicated before the United States Supreme Court” (pp. 12-13).

During the case, members of the Edgewood Concerned Parent Association representing their children and other similar children claimed that the school finance system in place, which allowed districts to provide enrichment to students based on their local tax rate beyond the Minimum Foundation Program (MFP) provided by the state, created inequities due to the vast differences in property value from district to district. While property-wealthy districts could provide considerably more enrichments at considerably lower tax rates, property-poor districts were languishing behind in facilities, materials, and overall ability to pay for education. In its argument, Edgewood ISD was compared to Alamo Heights ISD, an affluent suburb of San Antonio which bordered Edgewood. At the time, Alamo Heights ISD was able to raise an additional enrichment of $333 per student above the MFP provided by the state at a tax rate of $0.85 per $100 valuation of property. On the other hand, Edgewood ISD was only able to provide an additional enrichment of $26 per student while taxing at a rate of $1.05 per $100 of valuation. Similar differences could be found throughout the state of Texas. Because of the immense differences in the value of property between property-wealthy and property-poor districts, wealthy districts were able to raise much more money for their students' education at a far lower rate (Walsh, Kemerer, & Maniotis, 2005).

A three judge panel agreed with Edgewood parents and ruled that the system of school finance in Texas did, in fact, violate the equal protection clause. However, in a 5-4 decision, the U.S. Supreme Court overturned the lower court's ruling while stating the finance system "did not deprive anyone of a fundamental constitutional right, and did not discriminate against any particular group in violation of the Fourteenth Amendment equal protection clause" (Walsh, Kemerer, & Maniotis, 2005, p. 35). The Supreme Court noted that the school finance system in Texas, while not perfect, did have some measures which helped alleviate the discrepancies in the finance system. Despite these measures, the Court implored the Texas Legislature to develop a school finance system to end the glaring differences between property rich and poor districts. (Cardenas, 1992; Dawn, 1999; Walker, 1990; Walsh, Kimerer, & Maniotis, 2005).

Rather than creating a fundamental change in the way schools were financed, the Legislature began to restructure the system with a patchwork of laws and regulations, each time failing to allocate adequate funds to correct the system (Walker & Casey, 1992; Walsh, Kimerer, & Maniotis, 2005). The largest of the laws passed by the Legislature in an attempt to end the inequity issues of school finance was House Bill 72 (HB72) in the summer of 1984. The intent of HB72 was to create mechanisms which fostered equalization through the creation of a basic allotment for each student in the state. However, the significant flaws and inequities in the system remained and, in fact, increased.

The Edgewood Cases

While San Antonio ISD v. Rodriguez was unsuccessful, Edgewood v. Kirby became the catalyst for school finance reform in Texas that is still underway today (Bingham & Jackson, 2005; Walsh, Kimerer, & Maniotis, 2005). While the Rodriguez case attempted to use federal law to as an impetus of change, Edgewood v. Kirby attacked the school finance system at the state level. In Edgewood, the plaintiffs argued that the system of school finance in Texas failed to provide an equitable and efficient system of as required by the Texas Constitution. A key component of the Edgewood argument was that school district boundaries were drawn in a way that created vastly unequal amounts of property wealth that varied widely from district to district. These boundary drawings created huge discrepancies in the amount of money that could be raised through the use of local taxes from district to district and created an inefficient system of funding. In Edgewood, efficiency was interpreted to mean both the proper distribution of money to secure the best education and the conservation of education resources (Walker, 1991). A critical source of inefficiency, as argued by the plaintiff and affirmed by the court, was that district boundaries created areas of highly unequal property wealth.

Another major component of the plaintiff's case sought to establish that the system of school finance in Texas was discriminatory towards pupils, particularly Mexican-American students, living in property poor districts. As Alemán (2006) notes, "poor school districts, which largely are composed of poor people of color, are…affected most detrimentally by the funding system" (p. 114). Lawyers from the Mexican American Legal and Education Fund (MALDEF) and the Equity Center, a non-profit organization which analyzes school finance issues, worked together with the leadership of Edgewood ISD to argue the case. While MALDEF promoted a race-based argument for the inequities in school finance, the Equity Center focused on a wealth-based discrimination legal argument (Alemán, 2007; Dawn, 1999; Farr & Trachtenberg, 1999). Both the MALDEF and Equity Center argued that the inequities of the school finance system in Texas failed to meet the equal protection under the laws guaranteed by the Texas Constitution.

In 1987, the state district court in Travis County declared the existing system of school finance unconstitutional (Dawn, 1999; Walker, 1991; Walsh, Kimerer, and

Maniotis, 2005). The judge cited the Article 3, Section 1 of the Texas Constitution that provides, in part, that all free men have equal rights. The judge gave the state legislature until September 1, 1989 to enact a constitutional finance system. Immediately, state official appealed the ruling of the district court to the Court of Appeals, where, citing precedent established in the San Antonio ISD v. Rodriguez case, it was ruled that education was not a fundamental right provided by the Texas constitution and the Texas school finance system should not be subject to strict scrutiny analysis. The Court of Appeals also determined that reliance on local property tax was rational and was necessary to provide local control of the public schools.

Edgewood v. Kirby eventually made its way to the Texas Supreme Court, which overturned the ruling of the Court of Appeals and affirmed the decision of the district court (Addonzio, 1992; Dawn, 1999; Walsh, Kimerer, and Maniotis, 2005). The court noted that if a system of finance is not efficient or suitable the legislature has not fulfilled its constitutional duty. Therefore, the Texas Supreme Court mandated the legislature to correct the inefficiencies in the finance system by May 1, 1990. In the ruling, the Court made the observation:

> Efficiency does not require a per capita distribution, but it also does not allow concentration of resource in property-rich school districts that are taxing low when property-poor districts that are taxing high cannot generate sufficient revenues to meet even minimum standards. There must be a direct and close correlation to it, in other words, districts must have substantially equal access to similar revenues per pupil at a similar level of

tax effort…Certainly, this much is required if the state is to educate its population efficiently and provide for a general diffusion of knowledge statewide (Walsh, Kimerer, & Maniotis, 2005, p. 36)

It is important to note, however, that the Texas Supreme Court based its decision entirely on the 'efficiency'[1] of the state funding system and not the 'inequity' of the system (Addonzio, 1992; Walker, 1991; Walsh, Kimerer, and Maniotis, 2005). In fact, the Texas Supreme Court took steps to avoid ruling on the equal protection analysis used by the lower courts. Instead, the Court ruled that school finance system where property-poor districts end up with less revenue despite taxing at higher levels is inherently inefficient. The Court then cited an "implicit link between efficiency and equality" (Edgewood v. Kirby, 1989), meaning that it was impossible for an inefficient funding system to be equitable. Since the Court had already ruled the finance system was inefficient, it did not render a decision on whether or not the state finance system was, in fact, inequitable (Walsh, Kimerer, & Maniotis, 2005).

Another important ruling made by the Texas Supreme Court in the original Edgewood case was the Supreme Court's decision to lessen the impact of the district court's ruling that districts must be able to raise revenue at the same rate (Addonzio, 1992; Walker, 1991). Instead, the Supreme Court pointed out that an efficient system of finance "does not preclude the ability of communities to exercise local control over the education of their children" (Walker, 1990, p. 10). The Court ruled that tax revenues at

[1] Efficiency, as defined by the Texas Supreme Court in this case, relates to the ability of a district to generate revenue with a similar taxing effort as other districts. This definition of efficiency is different than the definition used in this study and a majority of education literature.

any given rate need only be “substantially equal” between districts. This clause in the ruling is important because it gave the legislature more latitude in developing a finance system, and the highly ambiguous phrase opened the door for continued inequities by not answering the question as to whether local taxes would be matched by the state through an equalizing formula (Addonzio, 1992).

Facing a deadline to create a school finance system that was constitutional, the Texas Legislature struggled to develop a new plan for school finance. Their solution, Senate Bill 1 (SB 1), was passed in the summer of 1990 and soon found its way back to the Texas Supreme Court (Addonzio, 1992; Hobby & Walker, 1991; Walsh, Kimerer, & Maniotis, 2005). In the case that became known as Edgewood II, the district court held that the modifications to the finance system remained unconstitutional and therefore invalid. The Texas Supreme Court upheld the ruling of the district court by citing the statute failed to rectify the opportunity gaps between property rich and poor districts. The Court chided that SB1:

> Leaves essentially intact the same funding system with the same deficiencies [the court] reviewed in Edgewood I…The fundamental flaw in Senate Bill 1 lies not in any particular provisions but in its overall failure to restructure the system. (Edgewood v. Kirby II, p. 495)

After the Edgewood II case, the Court became more explicit in its directions to the Legislature. The Court suggested that systematic change could occur by consolidating tax bases through the consolidation of school districts into 188 county districts to levy, collect, and distribute property taxes, thus removing administrative waste by eliminating duplicate positions and eliminating interdistrict disparities (Addonzio, 1992; Walsh, Kimerer, & Maniotis, 2005).

With the threat of consolidation looming, the Carrollton-Farmers Branch Independent School District (CFBISD) successfully sued the Edgewood Independent School District in a case that came to be known as Edgewood III (Addonzio, 1992; Walsh, Kimerer, & Maniotis, 2005). The argument made by CFBISD was that a county school district violated constitutional provisions requiring voter approval of property taxes and the prohibition of a state property tax. The Supreme Court essentially ruled against its own recommendations by affirming that a county district created a statewide property tax. As explained by Walsh, Kimerer, & Maniotis (2005), "now expressing considerable frustration and uncertainty, the Texas Legislature opted to let the voters have a chance to pass a constitutional amendment upholding the [county district] plan…The voters rejected the measure" (p. 38).

With a new impending deadline following the Edgewood III decision, the legislature passed into law Senate Bill 7 in 1993, the fourth school finance bill in just over 8 years (Alemán, 2006; Alemán, 2007; Dawn, 1999; Walsh, Kimerer, & Maniotis, 2005). The objective of SB7 was to comply with the Supreme Court's mandate for substantially equal levels of revenue per pupil at similar levels of taxes. SB7 provided a multi-tiered approach to school finance with four tiers.

1. Per-capita allotment: a per pupil grant of money given to each district regardless of the level of wealth of the district

2. Tier 1: provided an allotment of $2,300 per student to all districts whose tax rate is set at $.86 or higher. The state pays for the difference between the basic allotment and revenue collected locally (i.e., a district that collects $1,500 per student in local taxes would receive an additional $800 per student from the state)
3. Tier 2: allowed for a guaranteed amount of money for property poor districts that choose to tax above the $.86 required tax rate from Tier 1. The state guarantees a minimum amount of revenue per weighted average daily attendance for every penny of tax rate.
4. Tier 3: allowed districts to levy additional taxes from the local tax rates to supplement the costs of programs. It also set a maximum tax rate for maintenance and operations (M&O) at $1.50 and $.50 for debt services (I&S).

However, the most revolutionary aspect of SB7 was that districts with a wealth level above $280,000 per pupil were subject to an Equalized Wealth Level, or recapture of their funds, from the state. The statute was quickly termed 'Robin Hood' because of its purported ability to pull funds from the rich districts to reroute the funds to poor districts. Also, provisions were placed in the statue through a weighted pupil approach and for the varying costs of local economic conditions known as the Cost of Education Index.

Once again, it did not take long for SB7 to end up in litigation over its constitutionality. Soon after the bill was passed a variety of districts, both property wealthy and property poor, argued that the finance system was once again unconstitutional (Dawn, 1999; Walsh, Kimerer, & Maniotis, 2005). Despite evidence that showed inequities in the system, Edgewood ISD v. Meno (Edgewood IV) was ruled to be constitutional by the district court and upheld by the Supreme Court. The only aspect of the finance system that the Supreme Court deemed unacceptable was the funding of facilities. A major addition to SB7 was added to address the deficiencies found by the Court. These additions, known as Instructional Facilities Allotment (IFA) and Existing Debt Allotment (EDA), were intended to help districts build and maintain facilities which aid in the "general diffusion of knowledge" required by Texas Constitution. Currently under the IFA and EDA program, districts whose local property wealth fails to meet the cost of funding school facilities can receive state assistance based on need until the funds allocated in the IFA and EDA program (roughly $170 million) are expended. Once expended, those funds are no longer available to schools.

West Orange-Cove Consolidated ISD v. Neely

The provisions under SB7 remained intact until the Supreme Court once again began hearing cases in 2003 (Faltys, 2006; Robertson, 2005; Walsh, Kimerer, and Maniotis 2005). The case, known as West Orange-Cove Consolidated ISD v. Neely, involved more than 300 school districts who sued arguing that they had lost meaningful discretion in the setting of their local tax rate. By that time, a majority of districts (70%) had a tax rate of between $1.46 and $1.50 per $100 valuation. Districts argued that they were neither able to raise their tax rate due to the cap set forth in SB7 and were unable to deal with inflation or other uncontrollable costs. The tax rate was no longer being used as a means to supplement the education of students and instead became necessary for schools to fund the most basic of programs. Districts argued that the tax rate constituted an unconstitutional state property tax because districts were forced to tax at this rate in order to provide an education to students. As a result, the $1.50 per $100 of valuation became both the floor and ceiling, thus eliminating any local discretion.

In 2004, District Court Judge John Dietz ruled in favor of the plaintiffs that the finance system in SB7 was an unconstitutional system of finance (Faltys, 2006; Robertson, 2005; Walsh, Kimerer, and Maniotis 2005). In his decision, Judge Dietz "ruled that the costs of meeting the constitutional mandate of adequacy exceeds the maximum amount of available revenue to schools, that many schools were forced to tax at $1.50 per $100 valuation which constitutes a statewide property tax, which is prohibited under the Texas constitution, and finally, that the State's school finance system is not financially efficient" (Robertson, 2005, p. 1). Judge Dietz set a deadline of September 15, 2005 for the Texas Legislature to develop a system of finance that was constitutional.

The case was immediately appealed to the Texas Supreme Court, where it affirmed in part and reversed in part the decision of the lower court by a vote of 7-1 (Faltys, 2006; Intercultural Development Research Association website, 2008). The Court did deem the $1.50 per $100 valuation cap set by SB7 as a de facto state property tax, which is unconstitutional according to the Texas Constitution. However, the Court disagreed with the lower court regarding several of the key components of the argument by the plaintiff. In its decision, the Texas Supreme Court reversed the ruling of the lower court when it:

- Deemed the level of funding for schools as adequate;

- Recognized that there was a disparity between rich and poor districts but did not deem the disparity as big enough to be unconstitutional; and
- Suggested consolidation of smaller school districts to increase fiscal efficiency.

The Court also recognized that the funding gap between property wealthy and property poor districts continued to create inequities in the funding of facilities. While admitting that property poor districts were unable to provide adequate facilities, the Texas Supreme Court would not rule that the funding system was inequitable or unconstitutional on those grounds; however, the Court did not rule out the possibility that it may do so in the future.

So, once again the Texas Legislature was charged with the creation of a new finance system. After three specially called sessions, the Texas Legislature was able to pass into law House Bill 1 (HB1), which attempted to meet the mandate of the Texas Supreme Court to develop a school finance system which once again provided meaningful discretion to school districts in setting tax rates (Equity Center, 2006; Guenthner, 2007). In HB1, the Legislature designated a large portion of the state's $8 billion dollar surplus to buy-down the school districts' tax rates. HB1 called for the reduction of property tax from $1.50 per $100 valuation to $1.00 per $100 valuation and allowed schools to tax an additional $.04 of what was termed "golden pennies." These "golden pennies" were not subject to recapture for property wealthy district and provided a guaranteed yield of taxes per weighted average of daily attendance (WADA) at the same rate as Austin ISD for property poor districts. In addition, HB1 allowed for an additional $.13 per $100 to be levied by districts with the approval of voters. The school finance system created in HB1 went into effect in the 2006-07 school year and continues to be the finance system in place through the end of the 2012-2013 school year and throughout the FAST. .

Accountability in Education

The 2002 renewal of the Elementary and Secondary Education Act, better known as No Child Left Behind Act (NCLB), marked the beginning of a dramatic shift in the era of accountability in U.S. schools as the Federal government, for the first time, placed itself squarely in the realm of public school accountability. Though there had been efforts at improving school accountability in the past, never before had the Federal government asserted itself in such an overt manner and with such an intensive effort to improve student performance. Moreover, the explicit goals of NCLB to improve academic performance and reduce the achievement gap between White students and students of color, along with the prescribed consequences for schools, districts, and states that did not meet the new standard of performance makes NCLB a unique—and controversial—piece of legislation. In order to better understand this new era of accountability, it is important to first examine the reforms in education over the prior 50 years to determine how schools have reached this new era of accountability.

Brown, Sputnik Pave the Way

In the years prior to and immediately following World War II, the definition of a good school was the efficient use of limited resources which provided a clean building with good textbooks where children could learn (Cuban, 2004). However, that notion changed when the father of a young African American girl in Topeka, Kansas decided that it was unfair that his daughter had to walk over a mile to a run-down, dilapidated "black" school when there was a perfectly good "white" school just seven blocks from their house. The resulting lawsuit, combined with four other similar lawsuits regarding the segregation of African American and White students, were packaged together and became the landmark Supreme Court case known as Brown vs. Board of Education. Brown had opened America's eyes to the fact that "separate but equal" was truly unequal, and while school districts were slow to enact the mandate of the Court, the floodgate of awareness and activities that lead to the civil rights movement in the 1960's had opened.

A few years later, a beach-ball-size satellite, known as Sputnik, proved the ability of the Soviet Union to create rocket propelled objects which travelled through space; objects that might one day transport intercontinental missiles onto the heads of innocent Americans on U.S. soil. This perceived display of aggression led then President Dwight D. Eisenhower to sign the National Defense Act in 1958 which brought a deluge of reforms to American schools (Cuban, 2004). Over the next decade, the rigor of math and science programs increased dramatically, while advanced placement courses and programs for the gifted and talented were added in an effort to meet the Communist threat.

The combination of the civil rights movement and the increasingly 'warm' Cold War led to a series of federal laws, culminating with the Elementary and Secondary Education Act (ESEA) of 1965 (Cuban, 2004). According to Cuban (2004), the ESEA "provided for the first time funds for poor schoolchildren to get a better education and improve their life chances. Senator Robert F. Kennedy (NY), fearful of districts' diverting and wasting federal funds, attached and amendment to Title I of ESEA that required annual evaluations" (p. 23). For the first time, schools were asked to provide more than just a clean, well-run building with instructional materials. They were required to provide a quality education which would lead to high student performance.

Despite the stated goals of the ESEA and the billions of dollars which was poured into schools, critics from both ends of the political spectrum argued that schools were failing students (Cuban, 2004). National scores on the Scholastic Aptitude Test (SAT) were falling and many felt that the social permissiveness of the late-60's and 70's—and schools' efforts to increase equity—was watering down the standards for students rather than raising standards (Harris & Herrington, 2006). While the new "Title" programs of the 70's may have given some financial accountability to schools, schools were left on their own to assess the academic performance of their students.

A Nation at Risk

Like Sputnik 25 years earlier, a report by the National Commission on Excellence in Education, titled A Nation at Risk (NCEE, 1983), highlighted and once again brought to the fore many of the shortcomings of the American educational system. Unlike the calls for equity brought forth by the Brown decision and civil rights movement, A Nation at Risk called for higher standards, better content, greater time on task, and an increased focus on teaching. According to Harris and Herrington (2006), "the ideas expressed in NAR [A Nation at Risk] represent not just a lack of interest in equity, but subtle opposition to the weakened standards that apparently resulted from the previous equity focus" (p. 213). When addressing the needs of disadvantaged students, A Nation at Risk suggested that a greater emphasis on resources and content is the only way to increase equity.

Standards Based Movement

The result of A Nation at Risk was a wave of educational reform which came to be known as the standards based movement. According to Smith and O'Day (1991), the standards movement that began in the early 1980's was a "top down" effort that resulted in very little gains in the educational performance of students. The initial efforts focused on many of the suggestions made by A Nation at Risk: increased graduation requirements, longer school days, higher standards for teachers, and more testing for students. These early efforts also resulted in national standards in the areas of math and reading yet did little to change the content of teaching. The early testing requirements were focused predominantly in the competence of basic skills.

As a result, a second "wave" of standards based reform was adopted, which based on "bottom up" reform (Smith & O'Day, 1990). This second wave was characterized by a call for the decentralization of decision making, a movement towards the professionalization of teaching, and an emphasis on the individual schools as the basic unit of change. The argument for this type of reform was that a bottom-up approach to reform leads to a greater sense of ownership and enthusiasm for reform by both teachers and students which would lead to a greater level of engagement by both parents and communities. While the merits of this type of reform are clear, Smith and O'Day cite two major factors which prohibit this type of movement from creating a true systematic change in schools: 1) a lack of coherence in the educational system, and 2) the pervasiveness of a basic skills mentality that still existed in schools. The multifaceted layers of policy making at the federal, state, and local level sent conflicting policies which could not be integrated in a manner which guaranteed student achievement. This fragmentation, as argued by Smith and O'Day, caused school officials to either "ignore or subvert some policies" (p. 3). In addition, the minimal competency tests developed by states at the time focused on "low-level skills and standards and mandated or encouraged the use of such tests as criteria for promotion or graduation" (p. 3). This fragmented structure of the school environment provided little support for improvement and undermined the ability to create systematic change.

The Era of No Child Left Behind

While some studies would argue that standardized tests have little impact on student performance (Hanushek & Raymond, 2006) or that the use of standardized tests to evaluate schools is flawed (Jones, 2004), there is little debate NCLB has ushered in a new era of accountability unlike any seen since the Brown decision. Also without debate is the fact that NCLB has placed the academic performance of historically disadvantaged students in a position of prominence never before seen. According to Torres (2004), this is due to the fact that "core to the act are provisions requiring local education authorities to ensure that all students, particularly those from disadvantaged backgrounds and minority populations, are performing proficiently in reading, mathematics, and science assessments" (p. 250).

NCLB has done the opposite of what Smith and O'Day (1990) pointed out as weaknesses in the earlier waves of standards based reform. It has given specific performance measures that require standardized tests which call for student performance beyond the basic competencies tested under prior systems. More importantly, NCLB holds schools accountable for many of the enduring issues in education, such as the achievement gap between White students and students of color, curricular issues, and the lackadaisical attitude that exists in many educators. NCLB forces schools, through a defined set of penalties, to address the needs of disadvantaged students who have historically been overlooked by schools.

While the social justice aspect of NCLB is often overlooked by educators and policymakers—either intentionally or unintentionally—the moral justification of NCLB is evident (Torres, 2004). The mandated reporting of student performance scores, not just as a whole but in several different subpopulations of students, is meant to show schools and districts are teaching all their students, not just certain groups of students. The reporting of the 'adequate yearly progress' of students is intended to show that schools and districts are not only intent on making a minimal score but are making effort to show growth and improvement of students. Despite its flaws, NCLB has forced schools to make conscious decisions about how to improve the education for all students.

The Next Wave

Gaining interest over the last two decades is the use of a 'value-added' model of student assessment (Kane & Stager, 2002; Rubin, Stuart, & Zanutto, 2004; Sanders, 1998). Under this model, students are no longer expected to only reach a certain standard of achievement on a given test. Students are expected to show a level of annual academic gain, no matter if the student is high-achieving, low-achieving, or shows average achievement (Sanders, 1998). While these types of state accountability tests are being used in some states (i.e., Tennessee) they are not yet being widely used as a means to measure student performance.

The new state accountability test in Texas—called the State of Texas Assessment of Academic Readiness (STAAR)—is one such test. The STAAR test, in addition to being designed in such a way to facilitate comparison of the growth of a student across time, will also be linked to teachers as a way of measuring teacher effectiveness. The concept is that the more growth a classroom of students' display, the more effective the classroom teacher is. The STAAR test has been administered since in the 2011-2012 school year, but it remains to be seen how effective it is in measuring either student growth or teacher effectiveness.

Despite the growing support for the use of value-added assessments, it is not yet known whether this is simply a fad or a wave of the future. However, what is known is the fact that NCLB created a new era of accountability, and it is highly unlikely that the push towards greater accountability will change any time soon.

Factors Which Effect School Efficiency

There are myriad numbers of factors, both internal and external, which affect the efficiency of school districts. In order to better understand efficiency, it is important to review what the current literature says on these various factors in order to provide a contextual background for this study. The following section reviews the current literature for the variables which will be analyzed for this record of study.

Does Money Matter?

The first and most widely debated topic in school finance is the question as to whether or not additional money in public education makes a difference in the performance of students. This debate can trace its roots back to the Coleman report (1966) which concluded that the strongest correlation with student achievement were not a result of the school but were related to the educational levels and resources in the home of students. The implication of this finding was that the school itself did not matter and that allocating more money to schools was not likely to have an impact on achievement.

This stance has faced substantial criticism through the years. Recent re-analyses of the Coleman report by Borman and Dowling (2010), which used more modern statistical methods, found that even when controlling for student characteristics, a large portion of student achievement can be explained by differences in the schools. This finding is also supported by the work of Konstantopolous and Borman (2011) who concluded that schools do, in fact, play meaningful roles in the delivering equality or inequality of educational outcomes, especially to females, minorities, and disadvantaged students. While the socioeconomic status of students and their families continue to be seen as the driving factor in student achievement, there exists considerable research which suggests that school quality has a substantial effect on student outcomes.

Perhaps the most widely cited source for the assertion that money does not matter in schools comes from the work of Hanushek (1986). Hanushek conducted a meta-analysis of the existing studies on school finance and recorded the findings of those studies from both within the U.S. and outside the U.S. Some of the findings found a positive relationship between spending and student achievement, while many others found either a no relationship between spending and achievement or a negative relationship. This contradictory evidence led Hanushek to conclude that "there appears to be no strong or systematic relationship between school expenditures and student outcomes" (p. 1162). This statement has become repeated by many politicians, interest groups, and has been used in throughout state and federal courthouses where school funding cases have been deliberated (Baker, 2012).

As can be expected, Hanushek's findings and conclusions have been widely criticized by public education advocates and researchers since its release (Baker, 2012). To begin, there has been much criticism of the studies reviewed by Hanushek, which were published in the 1960s and 1970s, which lack the advanced methodology used by today's researchers. In addition, critics of Hanushek cite the advancement of data quality, statistical techniques, and the overall understanding of educational production functions as reasons to dismiss Hanushek's findings. Other criticisms of Hanushek's work argue that Hanushek fails to differentiate between inconsistencies in the studies—which can be attributed to differences in the quality and scope of a study—and that Hanushek's conclusions are too far-reaching due to the lack of high-quality evidence.

Hedges, Greenwald, and Laine (1996) directly challenge Hanushek's findings by performing their own meta-analysis of school production. In the Hedges et. al. paper, the authors developed quality parameters to ensure that only high-quality research was included in their meta-analyses. These quality parameters included only the research which: 1) was presented in peer-reviewed journals using U.S. data, 2) included academic measures as outputs, 3) used only district- or campus-level data, 4) controlled for student socioeconomic characteristics, and 5) fit with longitudinal data. Hedges et. al. reduced the number of studies significantly and found that a majority of studies did find a positive relationship between spending and outcomes and that only “moderate increases in spending may be associated with significant increases in achievement” (p. 361). Research completed by Wenglinsky (1996) confirmed the findings of Hedges et. al. (1996) by finding that increases in the per-pupil expenditures in instruction and administration were associated with achievement due to their association with smaller class sizes, which raised achievement.

Hanushek (1997) responded to these criticisms by further refining his initial meta-analysis and responding to his critics. His findings further substantiate his initial claim “that there is not a strong or consistent relationship between student performance and school resources” (p. 141). He also criticizes the methods of Hedges, Greenwald, and Laine (1996) as using weak statistical methods on their sampling and that they had to make considerable manipulations to their studies in order to create their findings.

Researchers have continued to make adjustments to production function analyses by making incremental changes to both the inputs and selected outputs. Taylor (1998) included regional and geographic differences in costs as a method to control for varying differences in labor costs across states and regions. Figlio (1999) argued that the production function literature at the time was lacking due to the restrictive assumptions used by researchers and that the impact of school inputs may be higher than estimated. Dewey, Husted, and Kenny (2000) contended that previous studies of school resource effects on student achievement incorrectly control for both student socioeconomic status and parent educational level. Dewey et. al. believe that this method is incorrect due to the fact that parent educational level directly impacts the demand for resources in school, thereby diminishing the effect of schools on student outcomes. It is important to note that all three of these studies found a positive, though sometimes small, relationship between financial expenditures and achievement.

These and other researchers have highlighted several new, important difficulties that researchers involved with production function literature must now address. These are only a few of the many examples of the complexity of finding a direct correlation between school expenditures and student outcomes. As noted by Baker (2012), these difficulties include the varying geographic and economic contexts of schools, as well as the need to accurately account for the students' family backgrounds, which are often the driver of the level of local funding.

Programmatic Expenditures in Relation to School Efficiency

In addition to the debate as to whether money matters to schools as a whole, there is great debate as to where and how money is spent in schools. The State of Texas' funding mechanism, known as the Foundation School Program (FSP), recognizes and funds certain programs in schools which are intended to benefit specific student populations. According to the Texas Education Agency, those programs included:

1. Regular Education: programs intended for students in a district who are not receiving special education or career and technology education services.
2. Special Education: programs designed for students who have a federally defined disability and receive special education services.
3. Career and Technology Education: courses and programs designed to teach the skills necessary to gain entry-level employment in high-skill, high-wage jobs
4. Bilingual/English as a Second Language: programs designed to help students who primary language is other than English
5. State Compensatory Education: programs and services intended to supplement regular education students which are identified as at-risk
6. Gifted and Talented (GT): provides educational experiences beyond those provided by the regular school program who are identified as gifted and talented

These 6 programs, along with Cocurricular activities and Accelerated Instruction—which are both programs that receive no additional state funding—encompass programmatic expenditures made by school districts in their data reporting.

A review of the history of Special Education (SE) by Winzer (2009) describes the history of SE and its integration into the school system. Winzer explains how SE began as a result of World War II, when the contributions of adults with disabilities changed the view of many policymakers and educators in America. The Civil Rights movement of the 1960s pushed for the inclusion of students with disabilities and culminated with the passage of the Education of All Handicapped Children Act and the Individuals with Disabilities Act (IDEA). These laws established the right to a free and appropriate public education for all children, regardless of their disability, and required schools to provide individualized education for students with disabilities. The special education movement has evolved from being a movement of integration to one of inclusion.

There have been numerous studies done with the intent of calculating the cost of special education. Though the cost of SE varies by the need of the student, there is general consensus that SE costs roughly 2.3 times that of a general education program (Chaikind et. al., 1993; Sofko, 1997). Chaikind et. al. found that the cost range for students with disabilities above their non-disabled peers ranged from less than $1,000 per pupil for students receiving speech services to over $30,000 per pupil for those with deaf-blindness. The differences in costs are largely associated with the need for additional staff to work with SE students and the additional materials—technology, ambulatory devices, specialized instructional materials, etc.—that are often needed to effectively teach SE students.

While there is general consensus that it costs districts more to educate SE students, the effectiveness of SE programs is largely dependent on the instructional practices of educators. The findings of Russ et. al. (2001) suggest that larger caseloads on teachers and larger instructional group size has a negative effect on math and reading achievement while teacher attrition increases as the number of students served increases. However, Tremblay (2013) found that an inclusion model appeared to be more effective compared with the SE classroom setting.

Much like special education, the existing research on the effectiveness of career and technology education (CTE) is mixed at best. Silverberg et. al. (2002) found that student's enrolled in vocational coursework were less likely to complete a college prep curriculum than did graduates who did not participate in a vocational training program. Although, as pointed out by Cohen and Besharov (2002), it is important to consider that the design of CTE is to prepare students for workplace readiness and not necessarily academic achievement and that students who worked while in high school tend to be much more successful in the labor market than those who did not work.

The effectiveness of bilingual education is especially important in Texas due to the number of students who are English-language learners (ELL) in Texas. In Texas, the number of non-English speakers in Texas is 34% with over 90% of those students attending public schools (US Census, 2007). According to Han (2011), a lack of English fluency is often considered a major contributor to the long-held finding that ELL students have lower academic performance than do their English speaking peers, and as a result, it has been historically been the policy of educators to increase English proficiency as fast as possible. However, Han cites research by August and Shanahan (2008) as reason to reexamine the use of bilingual education as the best way to increase achievement in ELL students.

There have been multiple studies which have shown the positive effect of bilingual education to promote ELL students' performance. Research by Golash-Boza (1998) and Portes and Hao (2004) have found a positive relationship between bilingual fluency and higher math and reading scores, as well as the positive effects of bilingualism and abstract thinking (Bialysok, 1988; Rumbaut, 1995). Bilingual education has also been found to improve self-esteem (Portes & Hao, 2002) and an improved feeling of "cultural capital' in ethnic communities (Bankston & Zou, 1995; Portes & Rumbaut, 2006). Finally, studies by Fuligni, 1998) provide context to the importance of speaking the same language as one's parents has on the parent-child relationship and the improvement of communication in the home. Collier and Thomas (2004) studied the student records of over 700,000 students and found that students which received academic support in both their first and second language decreased the achievement gap when compared to students who were involved in pull-out or mainstream classes. Han (2011) concludes that bilingual programs encourage parent participation and help schools reach their overall educational goals.

The next program which receives funding from the FSP is Compensatory Education. Under §29.081 of the Texas Education Code, compensatory education programs are supplemental programs which are designed to help at-risk of dropping out of school. Compensatory education programs include programs such as Head Start and Title I programs (which receive federal funding). According to Beatty and Zigler (2012), the funding of such programs is largely dependent on the competing policies and political ideologies of the party in power. Zigler describes his time as the director of the Office of Child Development during the early 1970s when the transition from the Johnson to Nixon administration led to changes in compensatory education and child welfare policies. Zigler described how bureaucratic infighting and the increased financial pressures of the Vietnam War nearly led to the closing of the Head Start program.

Though the Head Start Program survived, compensatory education programs continue to be funded based on the political will of the party in power, and the results of these programs remain mixed. Slavin (1989) calls for major restructuring of programs in early grades as a means to ensure that all students receive an adequate level of basic skills for later in life. Slavin also asserts that the effectiveness of compensatory education is based on the effectiveness of the individual programs used.

The final program which receives additional funding from the state is gifted and talented education (GT). According to the National Association of Gifted Children (2013), gifted and talented education evolved after the Soviet Union's launch of *Sputnik* in the late 1950s and were further bolstered by the findings of *A Nation at Risk* (1983), which called for the raising of academic standards and promoting an appropriate curriculum for gifted learners. The 2002 passage of the No Child Left Behind Act expanded the availability of federal grants for GT education and modified the definition of GT students.

The question for many school programs, including GT, is whether the participation in such a program increases student achievement. To this end, research on the effectiveness of GT is mixed. Research by Bhatt (2009) indicates that participation in GT programs is associated with a significant increase in math standardized test scores and future participation in Advance Placement courses. Similar research conducted by Ruggeiro (2012) found that students participating in GT programs scored higher in state level reading assessments. However, research by Bui, Craig, & Imberman (2011) discount the gains in both math and reading and claim that only science achievement scores improve with the enrollment in GT programs. A majority of researchers—Renzulli (2012), Reis & Renzulli (2010), Dai (2013) to name a few—speak only to the social capital benefits associated with enrollment in GT programs. These results lead school leaders and policy makers to question the efficiency of GT programs and their overall impact on educational outcomes.

School District Size and Efficiency

School district size and consolidation continues to be a controversial topic in Texas and throughout the country for the last 100 years. This conflict is largely amongst advocates of local control and those who believe that quality and efficiency is increased as school districts become larger (DeYoung, 1987). Early advocates of the consolidation of schools arguments were threefold: 1) that larger schools allowed for a more efficient, centralized administration, 2) larger schools were able to divide children by grade-level, thereby allowing for more specialized instruction, and 3) better facilities could be provided at a lower cost (Cubberley, 1922). Cubberley and other advocates of consolidation were successful in their arguments as evidenced by the reduction of the number of school districts from approximately 125,000 in 1930 to less than 20,000 in 2000 (Berry, 2006).

Despite the call for consolidation, little empirical evidence existed for the financial savings that were predicted by Cubberley and consolidation advocates. Since that time, a number of studies have been conducted to in an attempt to find an “optimum size” of school districts. Riew (1966) found that financial advantages existed when increasing size due to lower costs per student and that high schools with enrollment of less than 900 would be most likely to benefit from consolidation. Sabulao and Hickrod (1970) calculated that the ideal size for efficiency was an enrollment of 750 for grades K-8, 500 for high schools, and 5,000 students in a district. Templeton's (1972) review of optimal size led to the conclusion that K-8 schools should be approximately 300-800 while high school enrollment should be between 1,000 – 1,500 students. The Illinois State Board of Education study (1985) found that high school enrollment should be between 500 and 1,300 due their ability to provide an array of course offerings, peak student achievement levels, and financial efficiency over smaller schools.

There have also been a number of studies which have supported the concept of the economies of scale due to the cost of maintaining schools that are at less than capacity or are redundant. McGuffey and Brown (1978) found that plant maintenance costs were 30% less per pupil than schools which were at 90 percent capacity and cost 50% less per pupil than did schools which were at 80 percent capacity. Nelson (1985) recognized the financial benefits associated school consolidation due to the savings in the maintenance of duplicate facilities.

Despite the apparent efficiencies found in larger schools, there is also considerable research that suggests that, at a certain level, diseconomies of scale begin to be seen for districts. Studies by Duncombe et al. (1995, 1996) and Reschovsky and Imazeki (1997, 1999) found that a U-shaped cost curve exists for most types of expenditures, meaning that efficiency rises until enrollment reaches a certain level and then begins declining. These studies found that an enrollment of approximately 6,000 students in a district yield that highest level of efficiency in total cost; however, Duncombe et. al. (1995) found that 90% of the savings were seen by the time a district reached an enrollment of 1,500 students.

The studies also found that different types of spending could have different levels of optimization. Operating or instructional costs of a district is maximized between 2,000 and 3,500 students, whereas transportation cost efficiency is seen just over 1,000 students. In one area—administrative costs—the studies found that savings in administrative costs could be seen across all levels of enrollment and that as much as one-half the cost decrease in the additional enrollment could be attributed to savings in administrative costs. However, Duncombe et. al. (1995) does conclude that without a reduction in the number of buildings used or the number of staff, consolidation is unlikely to save very much money.

Property Wealth and Efficiency

As noted previously, the ability for a district to generate revenue has been a source of both debate and litigation in Texas and throughout the country. *Edgewood v. Kirby* and *West Orange-Cove Consolidated ISD v. Neely* were both cases which relied heavily on the argument that state's funding mechanism was flawed due to the lack of equity as a result of differing property wealth of districts in Texas. While there have been numerous studies relating to wealth equalization efforts in Texas, there have been few studies which have tried to establish a connection between property wealth and efficiency.

A study based in Texas conducted by Miller (2012) found that property the level of property wealth of districts in Texas was associated with spending in only certain areas. Miller found that property wealthy districts spend more of their budgets in the area of capital outlay projects, which property poor districts expended more resources in payroll costs. Miller also found that mid-level districts—districts which were not considered property wealthy or property poor—spend a greater portion of their budget in the areas of contracted services, supplies and materials, other operating expenses, and debt service.

One study, Houck, Rolle, and He (2010), studied efficiency in the state of Georgia. Houck et. al. saw that higher wealth districts were actually more efficient than their peers. These high wealth districts had greater student performance on Advance Placement tests and coursework as well as graduation rates, but did not see a statistically significant difference on the state assessment in math or SAT scores. Houck et. al. conclude that exogenous district characteristics were significant predictors in the overall efficiency of districts.

Administrative Costs and Efficiency

There is a widely-held belief that poor educational performance in U.S. schools can be traced to the abundance of school administrators. These overblown bureaucracies not only take much needed financial resources from the districts, but they also create overly burdensome regulations on teachers which stifle creativity and the teachers' abilities to control their classrooms. Of course, these assertions are often made without empirical evidence because there is little evidence that suggests that the administrative bureaucracies have over-expanded their role in modern schools (Marlow, 2001).

The research of Brewer (1996) attempted to estimate the effects of administration costs on student output. Brewer hypothesized that there were two possible effects of administrative expenditures on student performance. Brewer's first hypothesis was that spending on administration actually lowers the output of students by reducing teacher productivity due to unwieldy policies and regulations. Brewer's other hypothesis was that administrative costs did not lower student output per se, but that administrative expenditures displace funds that might be used in a more efficient manner. Despite Brewer's hypothesis, he was not able to find a systematic significant relationship on the effects of school administration and educational productivity. According to Brewer, most of his models found that central administrative costs had a negative impact on output while building level administration tends to have positive effects.

Further research which supports the assertion that administrative costs are negatively associated with student performance is the work of Jacques and Brorsen (2002) which saw test scores negatively related to expenditures in school administration. Unlike the Brewer model, Jacques and Brorsen saw that administrative expenditures at the campus level did, in fact, create a lower output for students, while spending at the central office had no effect on student output—though Jacques and Brorsen did assert that the money could be spent more efficiently in other places. Another study, this one completed by Baker (2003), into the policy influences on the allocation of school district resources found that larger districts tend to spend less on administration and that districts which spend more money per pupil tend to spend that money on administrative costs rather than instruction. Baker further found that the amount of federal aid received by districts was negatively associated with central administrative and total administrative costs, suggesting that districts receiving more money from federal sources tend to spend more on administrative costs.

Despite this somewhat negative research, there are studies which suggest that spending in administration actually improves educational achievement. Marlow (2001) found that higher employment of administrators was found to raise verbal SAT scores and lower dropout rates. Marlow went so far as to suggest that there are too few administrators employed by school districts. Research conducted by Wenglisnsky (1997) also support the belief that increased spending in administration leads to high educational output.

Student/Teacher Ratio and Efficiency

The number of students in a class has the potential to affect the achievement of students in a number of ways. The number of students in a class effects how the classroom teacher interacts with students, how students interact with each other, and the overall level of social engagement of the classroom. The level of engagement in the classroom could have a direct impact on the level of noise in the classroom and the amount of disruptive behavior, which has an impact on the activities that the teacher is able to utilize. The number of students in a classroom also influences the ability of teachers to interact with individual students and small groups. Due to the widely held belief that students learn more when they are able to receive more attention from teachers, class size is one of the key variables in producing learning in students. Also, it is one factors that can be controlled by policymakers and school leaders (as opposed to family socio-economic background or parental involvement). Therefore, it becomes necessary to understand the current research on class-size and its effects on student achievement.

Between 1969 and 1997, the average pupil/teacher ratio in elementary and secondary schools declined from 22.7 to 16.6, a decline of nearly 27% (Campbell et. al., 2000). With such a large decline in the student/teacher ratio, many in the public might have expected to observe a large increase in student learning over the same period. However, what Campbell et. al. found was that scores from the National Assessment of Educational Progress (NAEP) did not see large increases in student test scores which were commensurate with the decline in the average student/teacher ratio. Science scores for students 17 years of age were lower in 1999 than in 1969, math scores were constant, and reading scores were only slightly higher. This might lead one to conclude that student/teacher ratio has little effect on achievement.

In reviewing Campbell et. al.'s work and others, Ehrenberg et. al. (2001) cited a variety of reasons as to why this conclusion should not be drawn. While Ehrenberg et. al. acknowledges that student test scores are measure of the performance of schools, they cite a number of other measures which should also be included in assessing the importance of smaller classes. Ehrenberg et. al. note that the student drop-out rate dropped from 15% to 11% over the same time period, meaning that more students—especially more struggling students who might have dropped out before the age of 17—took the NAEP test in 1999 than did in 1969. Ehrenberg et. al. also point to the percentage of high school students who attended college rose from 51.8% to 67% over the same period of time. Ehrenberg et. al. comment that the number of students living in a two-parent household dropped from 85% to 68% from 1969 to 1999, meaning more students living in households where parents were working as opposed to staying at home. Finally, Ehrenberg et. al. note that the number of families in poverty increased from 14.9% to 20.2% during that period. Ehrenberg cites this decline in "social capital" as factors which tend to make it more difficult for some students to learn and reduce the parents' ability to support educational efforts. Ehrenberg et. al. conclude their review by stating that in order to determine the true effects of class size, researchers must use statistical methods to control for these and other factors or conduct a true experiment where students are randomly assigned to different class sizes to determine the effect of the student/teacher ratio.

Perhaps the most widely cited experimental study into the effect of class size came from the state of Tennessee in the form of Project STAR (Student/Teacher Achievement Ratio). Began in 1985, Project STAR was a state-sponsored "demonstration" where students entering kindergarten where randomly assigned into one of three classroom settings—a class of 13-17, a class of 22-26, or a class of 22-26 with a full time aide—for 4 years. Teachers were randomly assigned and there were no special interventions, i.e. curriculum, professional development, that were given to the teachers at the time. After 4 years, the students were returned to a regular-sized classroom (Finn & Achilles, 1999).

Project STAR found statistically significant differences in achievement between students in small classes and large classes but no differences between classes with aides or without them. These differences began to be seen in the 1st grade and persisted for students in grades 5-7 even after the students were returned to normal classrooms. In addition, those differences were greater for minority students who seem to show a greater benefit in smaller classes than do their non-minority peers. Further work by Finn, Gerber, Achilles, and Boyd-Zaharias (2001) suggest the more years spent in small classes the longer the benefits for achievement last.

Another program which intended to study the effects of class size comes from the SAGE program in Wisconsin (Molnar et. al., 1999). In the SAGE program, several specific interventions, including class size reduction, extended hours, and “rigorous” curricula and staff development, were used at targeted schools which had more than 50% of the students below the poverty line. Class sizes were reduced to 12 to 15 students per class (average of 13.47) compared to 21 to 25 students (average of 22.42) in non-SAGE schools. Results of the SAGE program suggest a positive relationship between smaller class size and student achievement with larger gains going to African-American students. Though much smaller in scale than Tennessee’s STAR Project, the SAGE program in Wisconsin seemed to support the findings in the STAR Project.

As always, there are many critics of both the methodology and findings of class size studies. Hanushek (1999) points out that social experiments “are very difficult to design and implement, making it even less likely that a single trial will provide definitive answers” (p. 17). Hanushek also argues that the gains seen in smaller classroom sizes were found in the first or second year and remained steady through the remainder of the study, suggesting that the effects of smaller classrooms are consistent with a one-time effect as opposed to a cumulative effect. Another criticism, specifically of Tennessee STAR Project, was the non-random selection of schools there is a concern as to the generalizability of the findings.

Others have attempted to study the effects of smaller classroom sizes on teachers in order to explain any variation of student performance. Smith and Glass (1980) conducted a meta-analysis of the existing research at the time and concluded that smaller class size was associated with better teaching. Filby, McCutcheon, and Kyle (1983) studied the effects of smaller class size on teachers in schools in California and Virginia. In their research, two second grade classrooms were divided into three, therefore reducing class size by about one-third. The investigators then observed teacher behavior before and after the class-size reduction. The author's found that the teachers' instructional approaches were largely the same before and after and that instructional content and the way it was presented had not changed.

An analysis of the National Educational Longitudinal Survey (NELS) by Rice (1999) found that there was a slight change in teacher practices in secondary math and science teacher who had smaller classes, leading to more time with individuals and small groups and more innovative—film, student-led discussions, oral reports, small groups—compared to teachers in small classes. Betts and Shkolnik (1999) conducted a similar study and found, like Rice (1999), that teachers spent more time on individualization. However, Betts and Shkolnk (1999) found that teachers in smaller classes spend more time reviewing and that there was no association between class size and the amount of material covered by the teacher. Betts and Shkolnik conclude that the association between class size and instruction is small and had little practical significance. Finally, research completed by the CSR Research Consortium (1999) found that teacher practices in small classes were similar to those in large classes. In addition, content coverage did not differ by class size, though small classes received slightly more small-group and individualized instruction than did larger classes.

Finally, other recent studies (Cho, Glewee, & Whilter, 2012; Hoxby, 2000; Jepsen & Rivkin, 2009) on the effect of class size on achievement have been mixed. Cho, Glewwe, and Whitler (2012) results showed positive effects of smaller classes on mathematics and reading scores in Minnesota, though the effects were relatively small. The researchers found that a decrease of 10 students would increase scores by only 0.04 to 0.05 standard deviations. Cho et. al. conclude by stating that reductions in class size alone are unlikely to lead to sizeable increases in student learning.

While Jepsen and Rivkin (2009) found that smaller class size does have a slightly positive effect on student achievement, those effects were often negated by the poor quality of the new teachers hired to fill positions, especially in schools with high populations of economically disadvantaged students. Jepsen and Rivkin investigated the direct and indirect effects of the California Class Size Reduction (CSR) program. The CSR program in California called for the reduction of class size across the state and caused an immediate need of 25,000 new teaching positions in the state. As a result of the high need for new teachers, schools were inundated with large numbers of teachers who lacked experience and proper certification. These staffing problems were especially seen in high poverty, high minority districts. Despite the questions regarding teacher quality, Jepsen and Rivkin found that the CSR did increase achievement in early grades, but those gains were not maintained through the letter years.

Hoxby (2000) found that small class size did not have a statistically significant effect on student achievement. Hoxby used longitudinal data from 649 elementary schools in Connecticut and found that a 10 percent reduction in class size produced less than a 2 percent gain in achievement. Moreover, Hoxby found no evidence that class size reductions were beneficial to low income or African-American students.

From an efficiency standpoint, it is important to consider the cost of reducing class size versus the benefits of having smaller classes. The cost of hiring additional teachers is substantial, and the benefits of having smaller class sizes may not be seen immediately. As argued by Krueger (2003), anyone expecting large gains from reducing class size might be disappointed in the low returns. It is important therefore for researchers to be able to distinguish between studies which show gains in achievement compared to those which test for efficiency. Though high gains are possible, it is likely that those gains are not going to be seen as efficient.

Teacher Experience and Turnover and Efficiency

When studying teacher productivity and student achievement, nearly all recent studies include some measure of teacher experience (Harris & Sass, 2007). Results for these studies across a variety of grade configurations to have little or no effect. For elementary students, the relationship between teacher experience and student achievement for elementary math to be evenly split between positive and insignificant (Betts et. al. 2003; Boyd et. al., 2006; Clotfelter et. al., 2007; Hanushek et. al., 2005;

Jepsen, 2005; Rivkin et. al., 2005; Rockoff, 2004). However, a majority of these studies (Boyd et. al., 2006; Clotfelter et. al., 2007; Jepsen et. al. 2005; Rockoff, 2004) found that the relationship between teacher experience and reading to be positively correlated in elementary years. Findings for the relationship between experience and success were opposite when studying middle school teachers. Students math achievement was positively associated with teacher experience while split in reading achievement. At the high school level, Betts et. al. (2003) and Aaronson et. al (2007) find no significant relationship between teacher experience and student achievement while Clotfelter et. al. (2007) found positive effects.

Rockoff (2004) found that teacher experience had a significant positive effect on student achievement for both reading and math at the elementary, with stronger gains seen in reading. On average, Rockoff found that reading test scores were an average of 0.17 standard deviations higher for teachers with 10 or more years experience compared to beginning teachers. In mathematics, the effects were smaller with significant gains in achievement for the first two years but little or no effect beyond that. This finding was supported by the work of Rivkin, Hanushek, and Kain (2005) and Hanushek et. al. (2005). Rivkin, Hanushek, and Kain (2005) saw elementary teacher effectiveness increase during the first year or two but level off after three years with a greater effect on reading achievement, while Hanushek et. al. (2005) found that middle school teacher experience was only positively correlated for the first few years of teaching and that achievement gains ceased to be significant after that.

Other studies have found that there is no relationship between experience and achievement at any level. Munoz and Chang (2007) used HLM to research the effects of teacher characteristics on high school reading achievement in urban schools. They found that there was no predictive relationship between teacher experience and achievement. Heistad (1999) used a value-added model to determine the relationship between teacher characteristics and student achievement and found no significant correlation between the two. Finally, Stonge, Ward, and Grant (2011) did not find any relationship between teacher experience and effectiveness in their value-added study. Stonge et. al. even compared the achievement results for teachers with less than 5 years experience, 5 to 10 years experience, and more than 10 years experience and concluded that there were no significant differences between these groups. In summary, the preponderance of the literature shows that teacher experience has little or no effect on achievement and what effect there is exists only in the first few years of a teacher's career.

Another teacher characteristic that can play an important role in the achievement of students is the teacher turnover rates in schools. Nationwide, new teachers leave the profession at a rate of 30 percent after the first 5 years and at a rate 50 percent higher in high-poverty schools versus more affluent schools (Ingersoll, 2001). This turnover tends to be higher in urban and lower performing schools (Hanushek, Kain, & Rivkin, 1999).

Most existing research shows a negative relationship between turnover and achievement. Guin (2004) studied the effects of teacher turnover in elementary schools in a large urban district and found a significant, negative relationship between teacher turnover and the percentage of students who met statewide assessment standards in reading and math. Similar findings were made by Boyd et. al. (2011) and Hanushek, Kain, and Rivkin (1999). This negative impact is compounded, as argued by Darling-Hammond and Sykes (2003), in low-income schools where teachers leave prior to gaining the needed experience to become effective.

However, there are studies which suggest that teacher turnover may not be a detrimental to student achievement as some suggest. Hanushek and Rivkin (2010) researched the impact of teacher turnover in schools which predominately serve disadvantaged students. Hanushek and Rivkin conclude that these schools do experience greater turnover; however, the impact of that turnover is offset by the quality of the teachers who leave. The authors suggest that teachers who remain at their schools tend to have higher performance that those who leave, which suggests that high turnover is not nearly as damaging as many assume. Their findings do not support the view that teacher exits negatively affect the quality of education in schools.

Athletics and Efficiency

According to the National Federation of State High School Association (2008), over 7.6 million high school students participate in interscholastic athletics every year. Advocates of extracurricular sports programs often tout sports as programs which contribute to the overall education and the school experience of students. In order to participate in these sports, 48 of the 50 states have established eligibility requirements (Bukowski, 2010). According to Callari (2002), the most commonly used eligibility standards include a pass-to-play, a minimum grade point average, and a requirement that only allows for a specified number of failing grades. Researchers (Jansen, 1992;

National Federation of State High School Associations, 2008) have claimed that these standards have resulted in participants who have higher grades, higher attendance, fewer disciplinary problems, and lower dropout rates.

There have been several studies which reported the effect of extracurricular participation on academic performances. Camp (1990) found that females participating in more in extracurricular activities made better grades than their male counterparts and that their academic achievement was improved by their participation. Kilrea (1998) examined the relationship between ACT scores between extracurricular participants and non-participants and found that ACT composite scores were significant and positively related to participation in extracurricular activities. Kilrea concluded that these benefits were especially seen in students who have academic difficulties whose extracurricular participation positively influenced their academic success.

Large scale studies into the link between extracurricular participation and achievement show similar results. McCarthy (2000) compared the attendance and GPAs of participants and non-participants in Colorado and found that participants had higher GPAs and lower absenteeism than did non-participants. Van Duyne (2004) made a similar conclusion when comparing achievement between participants and non-participants in on statewide assessments. Van Duyne found a positive correlation between achievement on the Indiana Student Test of Educational progress and participation in extracurricular activities. Corbett (2007) also found higher achievement in students who participated in extracurricular activities on statewide assessments in New Jersey.

Of course, there continues to be the question as to what degree participation in extracurricular activities has on increased achievement. Research by Lumkin and Favor (2012) found that high school athletes scored an average of only 5 points higher in math and social studies, 4 points higher in reading, and three points higher in science on Grade 11 statewide assessments than did non-athletes. Results were mixed with regards to ACT scores, with male non-athletes outperforming male athletes in English, reading, and composite—though it should be noted that female athlete outperformed female non-athletes in all areas but reading. Lipscomb (2007) found that athletic participation is linked to a 2 percent increase in math and science standardized test scores.

School Efficiency as an Economic Model

While the current economic climate helps explain the need for schools to be more efficient, there is little consensus amongst researchers as to how to best determine what it means to be efficient in schools. They might be able to define it, but creating an agreed upon methodology has been harder to produce. Normative economic theories attempt to create a predictive model to determine how much it costs to produce at given result (Rolle, 2004). While this knowledge is important for educators and policymakers wishing to determine what the cost of education is, the mixed results of such studies have led others to develop different approaches to determine the efficiency of schools beyond traditional economic theory.

One such methodology used to study the efficiency of a school district can be credited to Charnes, Cooper, and Rhodes (1978) and is known as Data Envelopment Analysis (DEA). DEA is designed to measure the efficiency of decision making units

(DMUs) when the production function has multiple levels of both inputs and outputs. DEA compares the efficiency of an DMU relative to the highest performing DMU and is especially useful in not-for-profit DMUs such as schools because it is structured to control for multiple inputs (i.e. socio-economic level, family background) to organizations which have multiple outputs (i.e. standardized test scores, graduation rates). Some advantages of this type of methodology include the fact that DEA does create a predictive model of "what various DMU's should be able to produce in the way of outputs given the factor amounts and/or the relations between various inputs that may be described to them" (p. 440). Disadvantages, as noted by Berg (2010), are that results are reliant on the selection both inputs and outputs, the belief that it is not possible to test for best specification, and that the level of efficiency is likely to increase as more input and output variables are inputted.

While there have been a number of studies which use DEA to study school efficiency (Besent et al., 1982; Ray, 1991; Chalos & Cherian, 1995; Ruggiero, 1996; Duncombe, Miner, & Ruggiero, 1997) the results have been mixed. In Besent et al. (1982), the researchers analyzed 167 Houston elementary schools and included input factors such as prior year test scores, economically disadvantaged students, teacher student ratio, and teacher experience. Output data were aggregated scores on standardized tests. In their study, Besent et al. found that 78 schools (47%) operating inefficiently and 89 schools (53%) were found to be efficient. Ray (1991) analyzed 122 Connecticut high schools and used input factors which included teacher student ratio, administrator student ratio, family educational background, and socio-economic status.

Ray's analysis found that the productivity of schools varied widely across districts and can be ascribed to the differences in the socio-economic background of the communities. Chalos and Cherian (1995) studied 207 Illinois school districts and included inputs such as operating expenditures per pupil, attendance rate, teacher education, student/teacher ratio, and teacher experience. Output factors were math and verbal scores on standardized tests. Chalos and Cherian found that 71 districts operated above the median efficiency level and 81 operated below. In addition, they found that local property revenues and tax bases were positively correlated with efficiency.

Ruggiero (1996) analyzed 556 New York state school districts with input factors including teacher salary expenditures, personnel instructional expenditures, other instructional expenditures, and parent education level. Ruggiero's output facts were reading, math, and social studies test scores, as well as the dropout rate. Ruggiero's analysis found that 443 districts were inefficient and that those inefficient districts could reach the same level of results with 80% of the observed level of inputs. Districts where more residents had college degrees were found to be more efficient than districts with fewer college graduates. Finally, Duncombe, Miner, and Ruggiero (1997) used DEA to analyze 585 New York state school districts with the inputs of operating expenditures per pupil, average reading math scores, drop-out rates, percentage of households in poverty, students at-risk, students from single-parent homes, and limited English proficient students. Like the Ruggero's (1996) previous study of New York state school districts, Duncombe, Miner, and Ruggeiro (1997) found a high percentage of districts (88%) operating inefficiently with the average efficiency rate of those districts to be

76%. They also found that there is a negative relationship related between efficiency and school district size, percent of tenured teachers, and district wealth. Interestingly, the group also found that efficiency was negatively correlated to districts with high numbers of private schools, suggesting that competition between public and private schools does not increase efficiency.

Related to DEA is a methodological process to determine the relative efficiency of an organization known as stochastic frontier analysis (SFA). In SFA, researchers use cost functions and more dynamic statistical techniques in order to calculate the efficiency rate (Rolle, 2004). Rolle continues to explain that "the focus of stochastic frontier analysis lies in determining statistically the best-performing organization(s). If the statistically determined best-performing organization has lower costs than the remaining organizations, the residual organizations are labeled as inefficient" (p. 50-51). Unlike a DEA, SFA takes into account the statistical noise of the sample, and therefore tends to have a lower inefficiency rate (Barrow, 1991). SFA also allows the researcher to determine the allocative and technical efficiency of an organization depending on the availability of data and the form in which the output is measured.

As with DEA, several studies have used SFA to determine the efficiency of schools (Barrow, 1991; Deller & Rudnicki, 1993). In the Barrow (1991) study, Barrow studied 57 local DMU's in England over a four year span. Input variables for Barrow included the average cost per pupil, student enrollment, percentage of students on free and reduced lunch, percentage of students passing, at-risk students, and change in school roll over a two year period. Using a SFA model, Barrow found that school inefficiency ranged from 4% - 7%. More research using SFA included the work of Deller and Rudnicki (1993) who studied the production efficiency of elementary schools in Maine. In their findings, Deller and Rudnicki concluded that most Maine elementary schools were operating relatively efficiently, with the average efficiency level of 91%, with a high of 97% and low of 77% efficient. Deller and Rudnicki's data suggested that larger schools operated more inefficiently than smaller schools, and that increased non-instructional costs lead to inefficiency.

Another more recent study using stochastic frontier comes from Gronberg, Jansen, and Taylor (2011). Their results indicated that, unlike Deller and Rudnicki, the predicted per student cost of operating smaller schools is higher than the per student cost of operating larger school districts. Gronberg et. al. found that a district with 500 students is predicted to cost 11 percent more per student than a district with 1,600 students. The same 500 student district costs 16 percent more per student to operate than districts with 5,000 or more students. The Gronberg model indicates that the per-student costs continues to decline even as enrollment numbers exceed 200,000 students.

A third common technique used by researchers to study school efficiency is known as corrected ordinary least-squares (C-OLS). In this approach, "researchers use OLS regression to estimate a production, cost, or distance function, and then make a correction to the intercept term to reflect school inefficiency" (Taylor, 2010). In this approach, rather than comparing a school's efficiency to the highest rated school, the efficiency of a school is based on its performance compared to the average school. Again, as opposed to assuming that there is a frontier of school efficiency, which is done on both DEA and SFA, C-OLS assumes that the efficiency is distributed along a normal curve. Similar to both DEA and SFA, researchers applying C-OLS methodology must determine both the inputs and outputs which are to be measured.

FAST Approach to School Efficiency in Texas

In order to examine the cost-effectiveness of Texas public schools, the 81st Texas Legislative session passed House Bill 3 (HB3), which directed the State Comptroller of Texas to "identify school districts and campuses that use resource allocation practices that contribute to high academic achievement and cost-effective operations." Though a better understanding of cost-effectiveness of Texas Schools was not the only goal of HB3, the Financial Allocation Study of Texas (FAST) was created in order to examine the relationship between resource allocation and student achievement in a way that no other study ever has.

The Need for FAST

The task of creating an efficiency model in Texas was complex due to a variety of factors. To begin, the diversity of Texas students and school districts made it difficult to develop an efficiency model which was able to account for the variety of factors which influence both student achievement and resource allocation. Complicating the issue further is that fact that many of variables which influence both achievement and cost of education are beyond the control of school districts. Therefore, FAST researchers consulted a wide range of experts and interest groups—experts in the field of academic achievement and school finance, school superintendents, school board members, teachers, principals, and education groups—in order to create a model to explain efficiency.

FAST researchers developed methods to rate Texas districts and campuses on a "level playing field" for comparisons in both spending and student performance in order to identify school districts, charter schools, and campuses that yielded high academic achievement while keeping low-operational costs. Certain factors which are beyond the control of districts, such as geography and demographics, were weighted and controlled for in both the academic and financial aspects of the FAST study. Once a district's education achievement and spending index were calculated, FAST researchers developed a matrix which enabled every district, charter school, and campus to be rated on a scale of 1- to 5-stars.

However, it is important to note that the ratings used by the FAST are not meant to make judgment on the value of spending versus achievement. Priorities vary amongst districts. Some districts/campuses may find it valuable to offer chess, Latin, or other advanced coursework that come with a cost to a district. These expenditures may be valuable to those communities, but they might not have a direct effect on the measured achievement of students within the district. Those expenditures, though they may be measured as inefficient in terms of the FAST, may have a tremendous value to those districts and/or campus.

A second aspect of the FAST was the mandate to "identify potential areas for districts and campus improvement" (H.B. 3). FAST researchers, in addition to the rating of districts/campuses, evaluated the study outcomes and contacted districts which have succeeded in improving student achievement while keeping costs low. FAST researchers developed an extensive list of “smart practices” designed to help school districts improve their overall efficiency. These practices are tips shared by school districts across Texas as a way to produce cost savings. The FAST “smart practices” are intended to show other districts how they might be able to improve the effectiveness of their operations and educational programs. They are practical and many can be replicated by districts wishing to save money in a variety of areas. (See **FAST Smart Practices** below for further explanation)

Overall, the need for FAST is a direct result of the continued need for districts in Texas to provide an adequate education in an efficient manner. FAST ratings were not designed to be used as a ranking system which ranks the most efficient district down to the least efficient district. It was designed as a way for districts and campuses to be able to study how their expenditures compare with other similar districts and campuses to determine their relative efficiency and hopefully make changes in order to increase their own efficiency.

FAST Approach to Academic Achievement

FAST researchers understood the complications of creating a productivity model of education and took steps to ensure that problems which inevitably arise from the use of multiple inputs and outputs were resolved. As a result, the FAST measures the academic progress of schools using a value-added model (VAM) approach to educational outputs. Rather than measuring student achievement at a given level (i.e. passing rate or standardized test scores), VAMs measure student growth by controlling for a variety of characteristics of the students, campuses, and districts. As noted in its appendix, the FAST model "was used to measure annual academic growth and produce Academic Progress scores in math and reading for each campus and district. FAST researchers then combined progress in math and reading to create a composite academic progress score" (p. 8). The VAM approach has been used by several studies (Aaronson, Barrow, & Sander, 2007; Clotfelter, Ladd, & Vigdor, 2007; Biancarosa, Bryk, & Dexter, 2010), so its use in the FAST is not unique.

The first step in developing an academic progress score was for FAST researchers to determine how to best control for the vastly different demographic make-up that existed between both districts and campuses[2]. FAST researchers included several input factors for the model which were designed to control for the demographic make-up of students. These factors were based on a model for academic growth model used by Dallas ISD due to its long track record of use, its use of readily available data provided by the TEA, and the fact that TEA uses the Dallas ISD model in its own assessment of school districts. Input factors included:

- prior-year TAKS math score
- prior-year TAKS reading score
- gender
- English proficiency
- ethnicity
- family income (measured by those receiving free or reduced-price lunches)

[2] The description of FAST in this and subsequent paragraphs comes from the Overview section of the FAST report.

- Special Education status
- Gifted and Talented program status
- language of TAKS administration (English or Spanish for grades 4-6)
- grade level

The factors chosen for the FAST model are standard in the literature (Bembry et. al., 1997; Mendro et. al., 1994; Orsak et. al., n.d.) which uses such data as a way to create a school effect indicator on student achievement. The FAST model also included interaction terms made from the factors listed above in order to provide further control for the affect those factors had on academic progress.

To allow for a fair comparison of all students, FAST academic progress methodology used a two stage process, known as multi-level, random intercepts mixed model, in order to better represent the growth a student that can be attributed to the students' school district or campus. The first stage adjusted for the demographic make-up, while the second stage separated out the contributions of students and campuses to academic growth.

Once the control factors were determined and were able to be adjusted, researchers were then able to use linear regression analysis, specifically a hierarchal linear model (HLM), to quantify the relationships between an observed score and factors which affect the score. HLM models allow for the application of multiple regression analysis that enables the researcher to create different equations based on the level of observation (i.e. campus, district). Since educational data are often hierarchal—students are grouped at the classroom level, then campus level, then the district level—HLM modeling recognizes this structure and allows the researcher to include variables from all levels (Webster, Mendro, Almaguer, 1994). As a result, equations may be calculated at the class, school, or district level (Bryk & Raudenbush, 1992).

HLM measures academic growth by comparing students achievement based on current year scores on the state assessment—the Texas Assessment of Knowledge and Skills or TAKS—and prior year performance. The current year scores became the "post-test" while the previous year was considered the "pre-test." After researchers controlled for the other factors, the influence of a campus or district on students' academic progress was able to be scored.

Scoring involved a three-level campus model and a two-level district model. The first level of the model represents students while the next two levels are representative of the districts and campuses. According to the FAST appendix, "to produce estimates for each model, the levels were algebraically combined into a single equation called the mixed model. Estimates were then produced from statewide TEA data, with effects partitioned between districts, schools, and individual students" (p. 4). The researchers noted that the estimates were based the use of the maximum likelihood and were the best linear unbiased predictions—or Bayes residuals—which formed the basis for estimating campus effect on achievement.

FAST Approach to Resource Allocation

Like the Academic Progress scores, FAST researchers used multiple techniques to account for the difference costs associated with supplying educational services in diverse Texas communities. Cost of education varies in communities based on a variety of factors, including cost of living, geographic size, demographic make-up of students, and size of districts. In order to account for these vast differences, FAST researchers chose to compare districts and campuses to other districts and campuses which have similar characteristics—which they termed as “fiscal peers”—in order to gain a more accurate picture of resource allocation.

To begin, FAST researchers used an updated version of the National Center for Education Statistics’ Comparable Wage Index (CWI) to account for differing wages and differing costs of living which exist between areas. The CWI was used to measure the price of both professional staff and the non-professional staff of a district. In addition, FAST researchers included two measures of district size to control for the per pupil costs of districts, especially for small schools which have a much higher cost per pupil than do larger districts. FAST researchers controlled for both the enrollment of students and the number of square miles of a district as a method to adjust for the size of districts. Finally, FAST researchers included measures to explain the student population costs associated with diverse school districts. Student demographic data included in the FAST were the number of:

- limited English proficient (LEP) students
- economically disadvantage students
- high-needs special education students
- other special education students

FAST researchers recognized that these student factors require additional resources and can have a tremendous impact on the overall resources expended by a district and are common to cost function analyses in the literature (Costrell, Hanushek, & Loeb, 2008; Duncombe & Yinger, 2005; Gronberg et. al., 1994; Imazeki, 2004). As a result, FAST researchers controlled for these inputs when calculating the overall resource allocation of a district.

In order to create fiscal peers, FAST researchers used propensity score matching as a way to identify the fiscal peers of a district. Propensity score matching was used to identify a control group of up to 40 fiscal peers for each district. These fiscal peers were considered the 40 most similar districts and/or charter schools with regards to cost of living, size, and student demographics. Once the fiscal peers were established, FAST researchers were then able to provide a more accurate picture for resource allocation comparison. Similar methodology was used in the creation of campus level fiscal peers. FAST researchers noted that, due to the volatility and ever changing characteristics of both districts and campuses, fiscal peers for campuses were recalculated every year of the study and that the campus fiscal peer groups changed every year based on additional data.

As part of the creation of fiscal peers, FAST researchers divided school districts and charter schools were stratified into 7 stratum (Special Education Districts, very small K-12, very large K-12, Alternative Education Accountability districts, no elementary grades, no high school grades, and all other districts). Some of the stratum—i.e. very large K-12—had less than 40 districts or charter schools which fell into the stratum. These districts did not have 40 fiscal peers and were only compared to the other districts and/or charter schools which were part of the stratum. According to the FAST appendix, "each district can have a unique peer group, so that the peer groups of a particular districts' peers will not necessarily be the same" (p. 10), meaning that just because District A had District B in its peer group did not necessarily mean that District A was in District B's peer group. As a result, FAST researchers developed over 1,000 unique fiscal peer groups for the study. A similar method was used for the creation of campus level fiscal peer groups.

Once the fiscal peer groups were established, each of the fiscal groups were sorted into quintiles and each district was given a rating based on its position in the quintile. Quintile ratings ranged from "very low" spenders to "very high" spenders, with "average" districts having 40% of their peers spending less than them and 40% of districts spending more than them. See **Table 1**.

FAST Ratings

Once both the Academic Progress measures and the spending index were calculated, the FAST research team created a FAST rating matrix which integrated the academic performance and spending measures to distinguish districts which were responsible for strong academic performance at low costs. (See **Figure 1**) Once both the Academic Progress measures and the spending index were calculated, expenditures and

Table 1:
District Expenditure by Spending Index

Spending Index	Districts	Core Spending	Adjusted Core Spending
Very Low	193	$7,550	$7,675
Low	277	$8,613	$9,371
Average	282	$9,068	$10,260
High	254	$9,728	$11,315
Very High	195	$11,680	$14,066

Figure 1:
FAST Rating Matrix

ACADEMIC PROGRESS PERCENTILES + SPENDING INDEX = FAST RATINGS

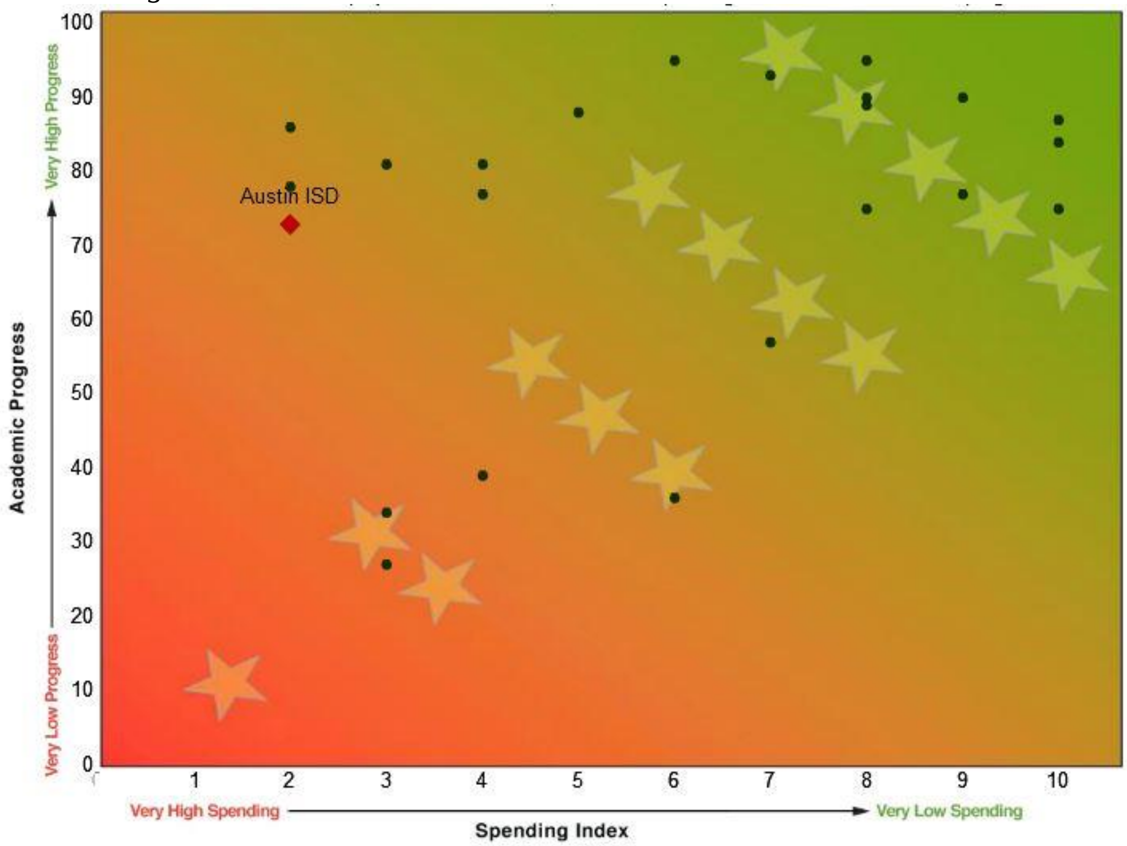
		SPENDING INDEX				
		"VERY HIGH"	"HIGH"	"AVERAGE"	"LOW"	"VERY LOW"
Composite Academic Progress Percentile	■■■■■ 80-99	3 STARS	3½ STARS	4 STARS	4½ STARS	5 STARS
	■■■■□ 60-79	2½ STARS	3 STARS	3½ STARS	4 STARS	4½ STARS
	■■■□□ 40-59	2 STARS	2½ STARS	3 STARS	3½ STARS	4 STARS
	■■□□□ 20-39	1½ STARS	2 STARS	2½ STARS	3 STARS	3½ STARS
	■□□□□ LESS THAN 20	1 STAR	1½ STARS	2 STARS	2½ STARS	3 STARS

outcomes were charted graphically to determine where respective districts were plotted in comparison to their fiscal peer groups. The FAST assigns a rating of one- to five-stars in terms of their educational outcomes and their financial inputs. 5-star districts were the most efficient in their use of resources and had a composite academic progress rating above 80 and have a spending index of "Very Low". 1-star districts were considered least efficient in that they had a composite academic progress rating of less than 20 and a spending index of "Very High." Districts were charted graphically to determine their overall rating. **Figure 2** below shows where Austin ISD falls on the FAST rating graph, with the red diamond representing Austin ISD and the black dots representing Austin ISD's fiscal peers.

FAST Smart Practices

In addition to determining the efficiency of schools and school districts in Texas, one of the mandates of the FAST study was to find smart practices for districts to use to

Figure 2:
FAST Rating – Austin ISD



increase their efficiency. The FAST found 4 areas of smart practices that are intended to improve both the efficiency and effectiveness of schools. Those areas are: 1) instruction and staffing, 2) financial management and technology solutions, 3) purchasing and student services, and 4) facilities.

In the area of instruction and staffing, the FAST found that many districts were able to save money by increasing class size to help manage payroll costs. In addition, the FAST notes that the use of online education and distance learning is an area in which schools can save money by limiting the number of teaching positions needed to provide courses and by using web-based programs to provide both coursework to students and professional development for teachers. The use of technology to aid districts in evaluating student achievement and to identify students at-risk of failing or dropping out was also cited as a smart practice by the FAST. Finally, the use of staffing analysis to compare staffing patterns across districts was also noted as being a possible method for schools to use to save money.

Under financial management and technology solutions, the FAST names the ability of district to refinance bonded indebtedness at lower rates as a way for districts to save significant money. Other solutions mentioned were conducting technological upgrades—such as switching to virtual servers—as a way for districts to save the cost of having multiple servers. Possibly the biggest area of savings, as shown by the smart practices in the FAST, was the use of cooperatives to save on purchases and of services provided to students. Purchasing cooperatives offer a way for small districts to purchase products by pooling their orders with other districts, thereby receiving a discount in economies of scale. Personnel cooperatives—either by sharing the cost of providing a service or sharing personnel with other districts—can provide significant savings to a district. Finally, contracting out services, such as transportation, food services, or maintenance services, are given as a smart practice for districts wishing to save money.

With regards to facilities, districts which use architectural prototypes to save money of building design fees is noted as a smart practice for large districts which are forced to build multiple campuses due to either enrollment growth or the need to upgrade from older, less efficient buildings. Districts are also saving money by acting as their own general contractor when building and repurposing buildings rather than constructing new ones. All of these smart practices are ways in which districts are saving money.

CHAPTER III

METHODOLOGY

Introduction

This chapter begins with an explanation of the design of the study along with a review of the research questions that will be studied. Next, an explanation of the research hypotheses and variables that will be tested, along with the rationale for each, is given. An explanation of the data is given including the source of the data, why the data were chosen, and the transformation of the data before analysis. From there, an explanation of the methods of analysis is provided, describing how the data will be tested to prove or disprove the given hypotheses. Finally, the methods used to ensure the trustworthiness and reliability of the data are discussed.

Design of the Study

The design of the study is to examine the effect of how school districts spend money on their overall efficiency rating as measured by the Financial Allocation Study of Texas (FAST). The per-pupil expenditures of each of the major financial function codes for each district will be examined, along with specific object financial codes that have been shown through literature to have an effect on the efficiency in district. The research design will use quantitative methods by conducting multivariate analyses to uncover possible connections between spending patterns and FAST rating.

Research Questions

The previous review of literature focused on the evolution of school finance in Texas and the emergence of school accountability. The review of literature also discussed the economic concept of school efficiency and the approach to school efficiency in Texas. This research and its design were designed to answer each of the following research questions:

1. Based on the FAST study, what are the spending patterns of school districts at each of the 5 rating levels of the FAST?
2. Does the district's allocation of resources predict the district's efficiency as measured by the FAST?
3. How do efficient districts compare in their resource allocation across the function and program versus less efficient districts?
4. Do other factors—district size, property wealth, administrative costs, teacher experience, student/teacher ratio, cocurricular spending—explain differences in the FAST measure of efficiency?

Research Hypotheses

The research hypotheses were established to analyze the possible implications of school spending in Texas in order to create a predictive model as to how schools in Texas are considered efficient when measured by the FAST. The current economic climate in Texas makes it essential for school leaders to be as efficient as possible with their funds. As schools are now expected to do more with less, there are increasing calls from state legislatures for districts to prove that they are doing all that can be done to provide their services in a cost effective manner (Lewis, 2008). While there is considerable debate amongst researchers as to which methods can or should be used to test for efficiency (Hanushek & Raymond, 2006; Jones, 2004), there is little debate as to the need for districts to be more efficient. It is important to remember that amongst many calling for more efficiency in school districts, there is an assumption that greater efficiency can be gained by school through organizational changes (Levin, 1997). There is also an assumption that efficient school districts allocate their resources differently than do inefficient school districts. An analysis of how districts spend money can explain some of those inefficiencies.

Differences in spending can come in a variety of ways, including programmatic, curricular, and personnel decisions, and it is important for school leaders to know what those differences are in order to better understand how to make decisions that lead to greater efficiency. The explanation of how and why schools are efficient can come from a variety of sources—academic research, politicians, practicing administrators, the general public, etc.—and the first step for researchers is to determine which variables are to be tested and create a logical rationale for testing each variable.

One of the most widely mentioned source of inefficiency in schools is the belief that schools have too many administrators and not enough money is spent on instruction. Research by Walters (2005) found that a statistically significant relationship exists between high achieving districts and low administrative costs per student, and that those same districts had the highest percentage of expenditures for instruction. Walters' findings were consistent with other research (Roper, 1996; Tuner, 1999) which found higher instructional spending was related to higher student performance.

In 2005, Texas Governor Rick Perry famously announced Executive Order RP47, which directed the then-Texas Commissioner of Education Shirley Neely "to develop an indicator requiring school districts to spend at least 65 percent of their budget directly on classroom-related expenditures" (2005). The "65% Rule," as it came to be known, gave Texas school districts three years to ensure that 65 percent of all expenditures were expended for instructional services as specified by the National Center for Education Statistics (NCES). Despite outcries from public education advocates and parents (Center for Public Policy Priorities, 2005), Perry pushed forward with his plan. However, in 2009 Governor Perry decided to scrap the 65 percent rule in favor of a better way to measure efficiency (Embry, 2009).

While Governor Perry admitted that the 65 percent number was an arbitrary number, it is still a widely held belief that money spent on instruction is a more efficient use of school resources. Therefore, as part of this study, an analysis of percentage of expenditures on instruction will be conducted. Additionally, it is assumed that more efficient schools spend less on administrative costs per pupil than do less efficient school districts. An analysis of administrative costs per pupil and efficiency as measured by the FAST will also be conducted and it is believed that the analysis will reject the null hypothesis that there is no difference between administrative costs per pupil and efficiency rating.

One of the key components of the definition of school efficiency is that school districts produce a certain level of output at a given cost. According to the FAST study, the output for schools is student achievement and academic progress on a variety of measures, including state accountability tests, graduation rates, and college entrance exams. One of the factors most often mentioned as increasing student achievement is strong staff development. Though there are a considerable number of studies that link professional development by teachers to increased student achievement (Kirjavainen, 2009; Ross, 1992; Sanborn, 2002), there is also a considerable body of literature that states that the professional development must be extensive and requires a large investment in order to be effective (Jacob & Lefgren, 2004). Therefore, it is expected that is a relationship between districts' spending on staff development and efficiency and that the analysis will reject the null hypothesis.

There are many other student characteristics that have been associated with high student performance and greater efficiencies in schools. Research has shown that schools with high numbers of low-socioeconomic students are less efficient (Ray, 1991) and that student attendance has an effect on the efficiency of schools (Chalos and Cherian, 1995). Also, districts with high number of Limited English Proficient (LEP) students are more likely to be inefficient (Dunbumbe, Miner, & Ruggerio, 1997). It is expected that districts with low levels of poverty, low numbers of LEP students, and high attendance rates are shown to be more efficient as measured by the FAST and that this study will reject the null hypothesis.

There has been great debate as to the extent to which the wealth level of a district, most often measured by property value, has on the efficiency of schools. Duncombe, Miner, and Ruggeiro (1997) found a positive relationship between efficiency and property wealth, meaning that as property wealth increases the efficiency of a district increases. Therefore, it is expected that the null hypothesis that there is no relationship between efficiency and property value will be rejected.

Another factor relating to the efficiency of schools is the size of a district. Researchers (Andrews, Duncombe, Yinger, 2002) have shown that there is potential cost savings when very small districts—500 or less pupils—grow to an enrollment of 2,000 to 4,000 students. Saving costs are primarily come from administrative and instructional savings. The authors continue to show that per pupil costs continue to decrease until enrollment levels reach approximately 6,000 students when the effects of diseconomies of scale begin to be seen. Andrews, Duncombe, and Yinger found that sizeable diseconomies of scale emerge once the enrollment of a district reaches 15,000.

Another argument made is that extracurricular activities, specifically athletics, are a misallocation of money and those activities should be funded outside the regular school funding mechanism (Miles, 2010). However, Scott Milder (2011), President and CEO of the non-profit agency Friends of Texas Public Schools, writes in his newsletter about a case study done in Northside ISD which shows that athletes have a higher attendance rate, higher graduation rate, and higher standardized test scores than do non-athletes. He further cites the data which show that athletes in Northside ISD have lower discipline referrals and that it is a myth that athletics and extra-curricular activities cost too much. While Milder points out that Northside ISD spent over $3 million in athletics in 2011, that amount represented only 1.47% of total expenditures in the district. According to the 2010-2011 Academic Excellence Indicator System (AEIS) report, school districts in Texas spent $1.15 billion dollars as a whole on extracurricular activities, which was approximately 2.6% of the total expenditures in the state. It is expected that schools that spend more money on athletics will be as measured more efficient by the FAST study and that the null hypothesis will be rejected.

Data Collection

The data to be used for this study comes from financial data available from the FAST study. Each year, the Texas Education Agency (TEA) releases data through its Public Education Information Management System (PEIMS). This data, which free to the public and is located on the TEA website, “encompasses all data requested and received by TEA about public education, including student demographic and academic performance, personnel, financial, and organizational information” (TEA website, 2012). This voluminous source of information allows researchers a vast supply of information that can be analyzed and manipulated as needed.

The researchers who conducted the Financial Allocation Study of Texas (FAST) used PEIMS data in order to conduct their study. The choice to use the FAST as a framework to study efficiency in Texas school districts is due to the fact that, currently, the FAST is used by the Texas Comptroller as the measure of efficiency in Texas. The FAST is an easy-to-use tool for practicing administrators and policy-makers to compare the relative efficiency of school districts. A knowledge of what efficient school districts do is important for decision makers who are trying to do more with less. It also allows for a comparison of districts on a per-student basis, not simply spending as a whole. The ability to compare districts at a per student basis is important because the total spending per district varies widely across the state relative to the size of each district.

For this study, the data collected were from data which are commonly used throughout education finance studies. These data included all spending by districts and charter schools to determine if the spending patterns existed between the most efficient districts and those districts which were rated less efficient. In addition, data were collected regarding the programmatic spending patterns of districts and charter schools to create a better understanding of the effects of programmatic expenditures and efficiency. The data on program spending included per pupil spending on each of the 6 programs reported by districts and charter schools to the TEA. Data were also gathered on the enrollment of districts and charter schools to ascertain whether the size of a district or charter schools had an effect on its efficiency. Data on the property value per pupil and property tax value were included to establish whether or not property wealthy districts were more efficient than those with less property value per pupil.

In addition to collecting data on the size, wealth, and spending patterns of districts, data were collected on a variety of other spending patterns were used in this study. The data regarding administrative spending of districts, including the overall spending on administration, the salaries of both central and campus level administrators, and the percent of both campus and central level administrators, were collected for analysis in the study in an attempt to clarify whether school districts waste money on administration. Data on teacher characteristics, including student/teacher ratio, teacher experience, and teacher turnover, were collected. This data were used to determine whether or not these teacher characteristics had an effect on the efficiency of districts. Finally, data were collected on the spending by districts on athletics. Athletic expenditures, especially in Texas where high school football is such an important part of the culture, are often cited as source of inefficiency in public schools. Therefore, it was necessary to collect data in this area to make conclusions as to whether spending on athletics was, in fact, an area of waste in public schools.

Data Analysis

STATA 12 for Windows© was used for data analyses. To begin the analyses, the FAST data was divided into the 5 data sets of district data based on their rating. The FAST rated districts in 9 different categories: 1-star, 1.5-star, 2-star, 2.5-star, 3-star, 3.5-star, 4-star, 4.5-star, and 5-star districts. Over three years of FAST data, there were 3,399 school districts and charter schools that were rated in the FAST. Of those, there were 96 (2.82%) 1-Star rated districts and charter schools. 267 (7.86%) school districts and charter school were rated 1.5-star. There were 421 (12.39%) 2-star rated districts and charter schools. There were 589 (17.33%) 3-st rated school districts and charter schools and 671 (19.74%) 3.5-star districts. There were 420 (12.36%) districts were

Table 2:
Overview of FAST Rated Districts

FAST Rating	2008-2009	2009-2010	2010-2011	Total Percent
1-star	24	37	35	2.82%
1.5-star	83	89	95	7.86%
2-star	145	142	134	12.39%
2.5-star	201	199	189	17.33%
3-star	225	218	228	19.74%
3.5-star	186	163	166	15.15%
4-star	138	140	142	12.36%
4.5-star	86	104	97	8.44%
5-star	43	46	45	3.91%

rated 4-star, while 287 (8.44%) were rated 4.5-star. Finally, there were 134 (3.91%) 5-star rated school districts and charter schools. See **Table 2**.

The next step in the analyses was to conduct multivariate analyses of districts across each of the 5 rating scales of the FAST. An ordered logit model was used to analyze data in the multivariate analyses. A multivariate analysis is a statistical method which entails observation and analysis of multiple variables at one time. Unlike univariate analyses, which describe the characteristics of only one category, a multivariate ordered logit technique allows study across multiple measurements while calculating the marginal effects and statistical significance of all the various independent variables on the dependent variable. This method helps the researcher to determine what is similar and what is different about the spending patterns for the district.

The multivariate analysis technique that will be used in this study is the ordered logit. The ordered logit is especially useful because, like other multivariate analysis techniques such as ordinal least squares (OLS) or an analysis of variance (ANOVA), ordered logits are able to identify statistically significant variables. However, unlike other multivariate techniques, ordered logits are able to discern differences between ordinal categories of the dependent variable. For example, the ordered logit does not assume the difference in spending between a 5-star district and a 4-star district is the same as the difference in spending between a 2-star district and a 1-star district. This differentiation is important because it allows for a more complete picture of the spending differences. An ordered logit is also appropriate for modeling FAST ratings because the ratings are categorical dependent variables—meaning the district rating will fall into one of the 5 ratings shown by the FAST—and because ordered logits are able to take into account the fact that some categories are more desirable than others, i.e. it is more desirable to be a 5-star district than a 1-star district. The ordered logit model is able to estimate both the statistical significance and direction of the relationship between the independent and dependent variable, as well as the marginal effect of each relationship. This technique increases the estimation power of the analyses.

The drawback to this multivariate analysis technique is that the predictive power of the model may appear low due to the number of dependent variable categories. By having 9 categories, the likelihood that the each variable is predictive is reduced. There are so many factors that affect the efficiency of schools that it is possible that that predictive value of one variable is affected by the presence of other variables. Despite this concern, the ordered logit is an appropriate and widely accepted technique for multivariate analyses.

As an example, by conducting an ordered logit on the relationship between administrative costs and efficiency of a district it may be possible to create an estimate of how much effect an decrease in the amount spent on administration will have on the efficiency rating of the district. If a district leader knows that an decrease in administrative costs by two percent can be estimated to create an increase of one category in efficiency rating—i.e., go from a 2-star district to a 3-star district—then it is possible for the district leader to focus ways to cut administrative spending in order to increase the district's rating in the FAST. An understanding of this type of relationship can help guide the district leader's decisions when formulating the budget for the district. This type of information can be extremely valuable to the district as tough decisions are being made when formulating the budget.

Construction of Variables

As noted previously, data will be collected through information available through the Public Education Information Management System (PEIMS) available on the Texas Education Agency's website. One drawback to this data was that some of the financial data available was provided as total expenditures, not per student expenditures. In order to create per student expenditures for all the data, the total expenditures in the PEIMS data will be divided by the average daily attendance (ADA) of the district. This method was the same as what is done with PEIMS data in the FAST. Per student expenditures allowed for a better comparison of spending due to the huge discrepancies in overall enrollment between districts, i.e. 200,000-plus students in Houston ISD compared with many districts with less than 500 students.

CHAPTER IV

FINDINGS AND RESULTS

Introduction

Chapter 4 presented the results of the descriptive statistics of the quantitative research. The findings and results of each of the 5 major variables to be tested were given and an explanation of each finding was provided. Chapter 4 began with an analyses of the expenditure patterns of school districts to determine where and in what areas highly effective districts spend their money. Next, an analyses of the results between relationship between district size and student demographics and efficiency as measured by the FAST. Following district size, results were given regarding the relationship between property wealth and FAST rated efficiency. Next, the findings and results of the relationship between instructional spending and efficiency were given followed by the findings on the relationship between administrative costs and efficiency as measured by the FAST. After administrative costs were presented, the findings and results of the relationship between class size and efficiency as measured by the FAST were provided. Finally, the findings and results of the relationship between athletic spending and efficiency were presented.

Expenditures by Function as a Predictor of Efficiency

In the many debates about school efficiency, one of the key points of contention was how and where schools spend money (Ferguson, 1991). It was therefore necessary to begin the analysis of school efficiency as measured by the FAST with an overview of where school districts and charter schools spend money. Spending data gathered from the FAST were analyzed by studying total expenditures and on the function level—instruction, administration costs, debt service, etc.—on a per pupil spending level. Both univariate and multivariate analyses from fiscal years 2009, 2010, and 2011 were included.

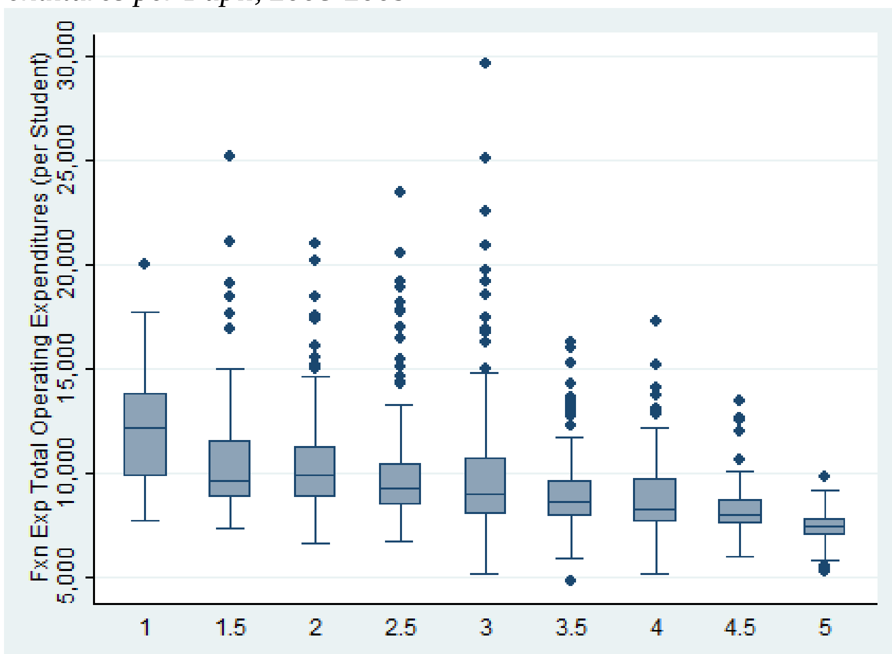
2008-2009 Data Analyses

In the 2008-2009 school year, FAST data reported that there were 1,131 school districts and charter schools which were measured by the FAST. The average total expenditures for all districts and charter schools were $9,607 per pupil, with a minimum expenditure of $4,876 per pupil and a maximum of $29,678. As part of the analyses a box and whisker diagram was created to help determine if any outliers existed in the data. Statistically, outliers are observations which deviate significantly from the other members of the population and could adversely skew the results. Based on the data, it was determined that districts and charter schools spending over $26,000 per pupil could be considered outliers and were therefore removed for the data. A total of one outlier was removed from the data. See **Figure 3.**

Once the outlier was removed the data were sorted into the 9 categories of the FAST and the measures of central tendency were calculated. A review of the data and show that the mean spending per pupil decreases as the FAST rating for the district increases. On average, 1-star districts spent more per pupil than 1.5-star districts. 1.5-star districts spent more than 2-star districts and so on. 5-star districts spent $5,259 per pupil, which was almost $3,400 less per pupil than 1-star districts. See **Table 3**.

In order to determine if there was a statistically significant difference in the

Figure 3:
Total Expenditures per Pupil, 2008-2009



levels of spending across the 9 categories of the FAST, a regression analysis was performed. The regression analysis showed that there was, in fact, a strong statistically significant difference ($p < .01$) across each of the categories of the FAST. These

Table 4:
Total Expenditures per Pupil by FAST Rating, 2008-2009

FAST Rating	# Obs	Mean	Standard Deviation	Min.	Max
All	1,131	$9,607	2563.584	$4,876	$29,678
1-star	24	$12,263	3040.873	$7,750	$19,979
1.5-star	83	$10,713	3128.953	$7,407	$25,238
2-star	145	$10,431	2479.34	$6,674	$20,987
2.5-star	201	$9,968	2526.05	$6,806	$23,512
3-star	224	$9,798	2810.818	$5,198	$25,098
3.5-star	186	$9,075	1746.932	$4876	$16,286
4-star	138	$8,869	1777.229	$5,207	$17,304
4.5-star	86	$8,298	1317.335	$6,060	$13,498
5-star	43	$7,355	1012.553	$5,311	$9,893

Table 4:
Distribution of Total Expenditures per Pupil by FAST Rating, 2008-2009

FAST Rating	Coefficient	Standard Error
1-star	12262.75***	477.2002
1.5-star	-1549.931***	541.8181
2-star	-1831.536***	515.1812
2.5-star	-2294.8***	504.8866
3-star	-2464.263***	502.1142
3.5-star	-3187.395***	507.0535
4-star	-3394.004***	517.0334
4.5-star	-3965.076***	539.6942
5-star	-4907.308***	595.6674

* p < .10, ** p < .05, *** p < .01

findings, though not surprising, clearly indicated that more efficient districts and charter schools do spend less per pupil, on average, than do their less efficient peers. However, the fact that there were inefficient districts which spent less per pupil than efficient districts indicated that where districts spend money was also a factor in efficiency. See **Table 4**.

Once the regression analyses were completed, an ordered logit regression was completed to determine if there was a relationship between the total operating expenditures per pupil and the overall FAST rating. As expected, the ordered logit showed that there is a negative, statistically significant relationship between total operating expenditures and FAST efficiency meaning that more efficient districts spent less on their total operating expenditures than did less efficient districts. The ordered logit also indicated that a negative relationship was present between the percent of students who were economically disadvantaged and the FAST rating, while a positive,

Table 5:
Ordered Logit Model of Total Expenditures per Pupil, 2008-2009

	Coefficient	Standard Error	Robust Standard Error
Total Expenditures per Pupil	-2.735697***	.2802609	.3052768
Total Enrollment Count	.0936392**	.0382701	.0413437
Economically Dis. (Percent)	-.0214989***	.0027742	.0030796

* p < .10, ** p < .05, *** p < .01

statistically significant relationship was present between district size and efficiency, signifying that larger school districts were more efficient when rated by the FAST than were smaller districts. See **Table 5**.

In order to take a more in-depth look at the spending patterns of the districts and charter schools and to determine what effect, if any, the size of a district and the socio-economic make-up of the district might have, an ordered logit was completed to determine which spending function had the greatest effect on the efficiency of the district. A total of 18 variables were inputted—the 15 functions of spending as reported by Texas school districts and charter schools, plus the total enrollment of the district or charter school, and the percent of students who were considered economically disadvantaged—with the hope of finding where districts and charters should spend or save money.

There were 6 spending functions that were found to have a statistically significant impact on the FAST rating. Data showed that districts which spent less per pupil on instruction and instructional leadership were likely to achieve a higher FAST rating. In addition, districts which spent less on student support services (i.e. nurses, guidance counselors, social work services), security, data processing services, and

Table 6:
Ordered Logit Model of Expenditures by Function, 2008-2009

	Coefficient	Standard Error	Robust Standard Error
Instructional Expenditures	-1.313329***	.3764404	.4091274
Instr. Related Expenditures	.0186212	.0762632	.0795295
Instr. Leadership Expenditures	-.0998491***	.0292942	.029731
School Leadership Expenditures	.056245	.1066213	.0903107
Support Services Expenditures	-.2364724***	.0623433	.0702972
Transportation Expenditures	.0152686	.0497195	.0548292
Food Services Expenditures	.0396065	.075253	.0744735
Cocurricular Expenditures	-.10887	.0629917	.0767683
Central Administrative Expenditures	-.0774943	.1762095	.1895212
Plant Maintenance Expenditures	-.2967514	.1774508	.2334317
Security Expenditures	-.0747272*	.043106	.044301
Data Processing Expenditures	-.0538697*	.0320173	.0323408
Community Services Expenditures	-.0688913*	.03814	.0398185
Debt Service Expenditures	-.0111339	.0260863	.0264398
Capital Outlay Expenditures	-.0146247	.0299724	.0303378
Total Enrollment Count	.371057***	.0804157	.0860743
Economically Dis. (Percent)	-.0207014***	.0031965	.0033928

* p < .10, ** p < .05, *** p < .01

community services also performed better on the FAST. All other functions of spending were found not to have statistically significant impact on overall FAST rating. It was also found a positive correlation for districts with higher student enrollment and the FAST and a negative correlation between low socio-economic student percentage and the FAST. See **Table 6**.

A Chi-squared easily rejects the hypothesis that the coefficients on all the expenditure categories are jointly zero. In other words, the analysis again demonstrates that differences in expenditure predict differences in FAST ratings. The test shows that the probability of having greater Chi-squared test statistic is 0.00, therefore one can reject the hypothesis that Expenditures by Function are irrelevant.

2009-2010 Data Analyses

Using the same methods as were used with 2008-2009 FAST data, data from the 2009-2010 school year were analyzed. In that year, the FAST rated 1,138 school districts and charter schools which spent an average of $9,749 in total expenditures per student. A box and whisker plot was again created to help determine if any outliers in the data existed, and it was found that there were 4 districts or charters schools which reported $0 total expenditures per pupil. It was assumed that there was an error in the data reporting

Figure 4:
Total Expenditures per Pupil, 2009-2010

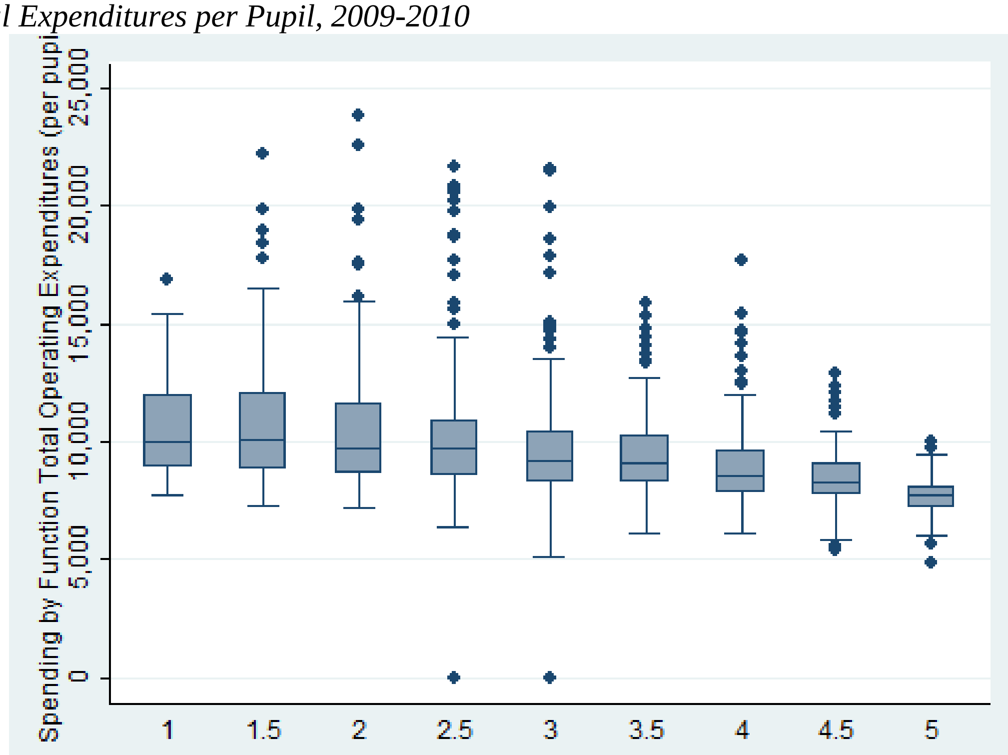


Table 7:
Total Expenditures per Pupil by FAST Rating, 2009-2010

FAST Rating	# Obs	Mean	Standard Deviation	Min.	Max
All	1,138	$9,749	2535.439	$0	$23,836
1-star	37	$10,603	2212.748	$7,730	$16,836
1.5-star	89	$11,014	3003.998	$7,284	$22,221
2-star	142	$10,637	2932.951	$7,205	$23,836
2.5-star	197	$10,399	2743.919	$6,401	$21,836
3-star	216	$9,819	2437.23	$5,098	$21,565
3.5-star	163	$9,450	1715.955	$6,106	$15,917
4-star	140	$9,008	1839.357	$6,161	$17,688
4.5-star	104	$8,508	1375.971	$5,411	$12,885
5-star	46	$7,733	1015.87	$4,879	$10,033

to the state for those 4 districts or charters, and those observations were removed from the data set. See **Figure 4**.

Districts and charter schools were once again sorted over the 9 categories of the FAST and the measures of central tendency were once again calculated. Unlike the 2008-2009 data, there was not a consistent drop in average level of spending across the categories. 2009-2010 saw the average spending of 1.5-star district higher than 1-star districts by almost $411, while 2-star districts also spent more on average per pupil than 1-star districts. However, the data showed that expenditures per pupil did decrease from 2.5- to 5-star districts, and 5-star districts spent an average of $2,870 less per student than 1-star districts. See **Table 7**.

Once again a regression analyses was completed to determine the statistical significance of the differences across the categories. As with 2008-09, a strong, statistically significant relationship ($p < .01$) existed between 3.5- to 5-star districts and 1-star districts. A slightly less ($p < .05$) statistically significant difference was found

Table 8:
Distribution of Total Expenditures per Pupil by FAST Rating, 2009-2010

FAST Rating	Coefficient	Standard Error
1-star	10602.51***	383.5925
1.5-star	410.9921	456.4155
2-star	34.78226	430.6778
2.5-star	-203.2648	418.0661
3-star	-783.6246*	415.1485
3.5-star	-1152.213***	424.9045
4-star	-1594.756***	431.3132
4.5-star	-2094.321***	446.6455
5-star	-2869.187***	515.2645

* p < .10, ** p < .05, *** p < .01

between 3-star districts and 1-star districts, and there was no statistically significant difference found between 1-star districts and 1.5-, 2-, and 2.5-star districts. See **Table 8**.

Once the regression analysis was completed, an ordered logit was run to see if the same relationship existed between total operating expenditures per pupil and FAST rating was present in 2009-10 as was present in 2008-09. As with the previous year, the data show that there was a negative, statistically significant relationship between total operating expenditures per pupil and FAST rating at the $p < .01$ level. Again, this finding indicated that schools which spend more on total operating expenditures per pupil are less efficient than those which spend less. Also similar to the findings in 2008-09, the

Table 9:
Ordered Logit Model of Total Expenditures per Pupil, 2009-2010

	Coefficient	Standard Error	Robust Standard Error
Total Expenditures per Pupil	-2.753417***	.2844209	.2790494
Total Enrollment Count	-.0159316	.0399333	.0413089
Economically Dis. (Percent)	-.0226379***	.002842	.0030425

* p < .10, ** p < .05, *** p < .01

Table 10:
Ordered Logit Model of Expenditures by Function, 2009-2010

	Coefficient	Standard Error	Robust Standard Error
Instructional Expenditures	-1.053749***	.3790796	.3991663
Instr. Related Expenditures	-.0466154	.0721885	.0744991
Instr. Leadership Expenditures	-.0865214***	.0294778	.0298802
School Leadership Expenditures	-.0838489	.1016141	.0738445
Support Services Expenditures	-.2231713***	.0600096	.0622122
Transportation Expenditures	.0594154	.0493692	.0583002
Food Services Expenditures	.0967814	.0805369	.0892133
Cocurricular Expenditures	-.1021459	.0595839	.0705023
Central Administrative Expenditures	.2180447	.01654578	.1812781
Plant Maintenance Expenditures	-.6207935**	.1810016	.2815515
Security Expenditures	.0232077	.0426366	.0445849
Data Processing Expenditures	-.0444106	.0330473	.0357576
Community Services Expenditures	-.095488**	.0370028	.0390254
Debt Service Expenditures	-.0068729	.0249826	.022358
Capital Outlay Expenditures	-.0313243	.0259984	.0248795
Total Enrollment Count	.3394349***	.078143	.0879813
Economically Dis. (Percent)	-.0274324***	.0032835	.0035039

* p < .10, ** p < .05, *** p < .01

percent of students who were economically disadvantaged has a negative impact on the overall efficiency of a district. However, data from 2009-10 did not see a significant relationship between district size and efficiency. See **Table 9**.

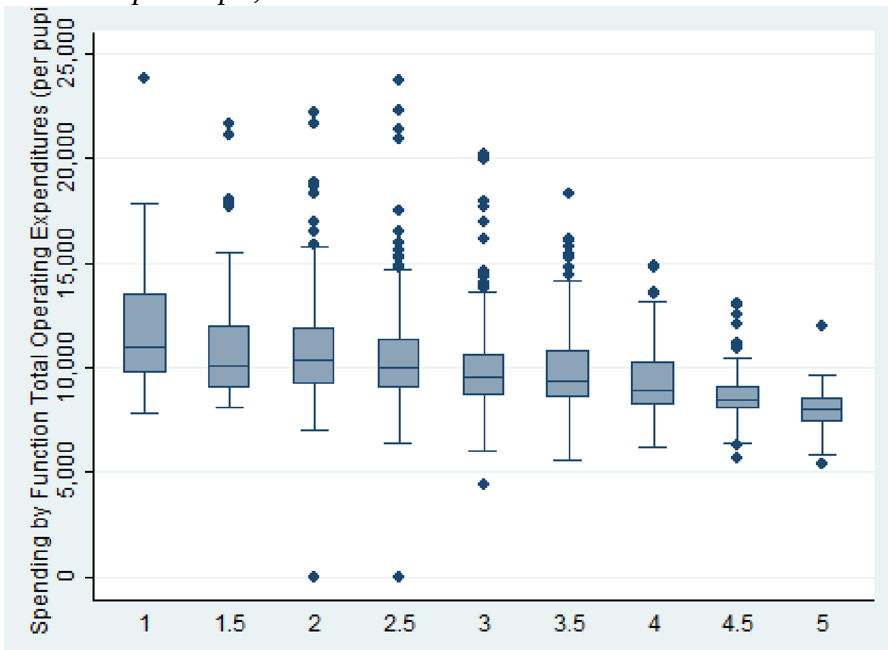
Once again an ordered logit was conducted to determine how the spending patterns of districts might impact on the FAST rating. Unlike 2008-09, which saw 6 of the 15 functions of spending have an impact on FAST rating, 2009-10 data indicated that 5 of 15 functions of spending had a statistically significant relationship on the FAST rating. Once again, there existed a negative correlation between instructional expenditures, instructional leadership, student support services, and community services expenditures and efficiency. However, 2009-10 data showed no statistically significant difference in the areas of security expenditures and data processing expenditures. New to the findings was that a negative, statistically significant difference was present between plant maintenance and operations costs ($p < .05$). The size of a district or charter school was once again positively related to FAST rating, while the negative, statistically significant correlation between economically disadvantaged students and FAST rating was once again seen in the data. Once again, the Chi-squared test revealed that the probability of having a greater Chi-squared statistic is 0.00 and the hypothesis is rejected. See **Table 10**.

2010-2011 Data Analyses

In the final year of FAST data, there were 1,130 districts and charter schools rated by the FAST. Those districts and charter schools spent an average of $10,066 in total expenditures per pupil. A box and whisker plot was once again created to view the distribution of expenditures per pupil across the 9 categories of the FAST and to determine if any outliers were present. As in 2009-10, it was determined that school districts and charter schools which did not report any total expenditures per pupil would be considered outliers and were removed from the data set. A total of 3 outliers were removed. See **Figure 5**.

Overall, the average total expenditures per pupil decreased as FAST rating increased across the categories. There were two exceptions. 2010-11 data showed that 2-star districts expended more per student—$131 more—than did 1.5-star districts and 4-star districts spent $22 more per student than did 3.5-star districts. 5-star districts, which spent less on average than all other categories, spent over $4,000 less per student than

Figure 5:
Total Expenditures per Pupil, 2010-2011



did 1-star districts and charter schools, which had the highest average expenditures per pupil. See **Table 11**.

Once the measures of central tendency were calculated, a linear regression was

Table 11:
Total Expenditures per Pupil by FAST Rating, 2010-2011

FAST Rating	# Obs	Mean	Standard Deviation	Min.	Max
All	1,136	$10,066	2494.695	$0	$23,831
1-star	35	$12,101	3342.16	$7,820	$23,831
1.5-star	95	$10,887	2670.855	$8,120	$21,676
2-star	135	$11,018	2689.718	$7,040	$22,229
2.5-star	188	$10,597	2576.45	$6,434	$23,752
3-star	229	$10,063	2432.239	$4,433	$20,236
3.5-star	166	$9,337	2067.318	$5,591	$18,345
4-star	143	$9,359	1668.461	$6,220	$14,871
4.5-star	97	$8,718	1310.74	$5,658	$13,102
5-star	45	$7,998	1138.416	$5,437	$12,024

Table 12:
Distribution of Total Expenditures per Pupil by FAST Rating, 2010-2011

FAST Rating	Coefficient	Standard Error
1-star	12101.23***	388.3245
1.5-star	-1214.229***	454.2602
2-star	*1083.695**	735.765
2.5-star	-1504.425***	422.9298
3-star	-2038.713***	416.9452
3.5-star	-2164.367***	427.3058
4-star	-2742.69***	433.2482
4.5-star	-3383.548***	452.9976
5-star	-4103.495***	517.766

* $p < .10$, ** $p < .05$, *** $p < .01$

conducted to determine the statistical significance of the differences. Again as in 2008-09, there was a statistically significant difference found between each of the 9 categories of the FAST, with 8 of the 9 categories showing a significant different at the $p < .01$ level. Though it should be noted that the expenditures per pupil increased overall between 2008-09 and 2010-11. 5-star districts in 2010-11 spent an average of $634 more per pupil than in 2008-09 and $265 more per pupil than in 2009-10. See **Table 12**.

Once the regression analyses were finished, an ordered logit regression was done to determine whether a relationship existed between the total operating expenditures per pupil and FAST rating. As with the prior two years of data, the ordered logit revealed a negative, statistically significant ($p < .01$) relationship between total operating expenditures and FAST rating. As with the two prior years, there existed a negative relationship between the percent of students who were economically disadvantaged and FAST rating. Unlike either of the two previous years, district size was found to also have a negative, statistically significant relationship ($p < .10$), but this difference might have

Table 13:
Ordered Logit Model of Total Expenditures per Pupil, 2010-2011

	Coefficient	Standard Error	Robust Standard Error
Total Expenditures per Pupil	-3.008492***	.3002277	.3098659
Total Enrollment Count	-.0675212	.045155	.0422137
Economically Dis. (Percent)	-.0238879***	.00286	.003123

* p < .10, ** p < .05, *** p < .01

been a result of changes in the calculations of the FAST fiscal peers in the third year of the study. See **Table 13**.

The final step in the process was to complete an ordered logit analyses to verify whether spending by function had any predictive value in 2010-11. The findings for the

Table 14:
Ordered Logit Model of Expenditures by Function, 2010-2011

	Coefficient	Standard Error	Robust Standard Error
Instructional Expenditures	-1.015481**	.3969665	.4183498
Instr. Related Expenditures	-.1376984	.0799812	.0937104
Instr. Leadership Expenditures	-.071555**	.0295365	.0300013
School Leadership Expenditures	-.0953158	.1031472	.0980695
Support Services Expenditures	-.1178256**	.0578106	.0565998
Transportation Expenditures	.0061295	.0494357	.058967
Food Services Expenditures	.1351098	.0868703	.1001056
Cocurricular Expenditures	-.1039321	.0605883	.0664807
Central Administrative Expenditures	.0488069	.1692684	.1803632
Plant Maintenance Expenditures	-.6167241**	.1605272	.2409025
Security Expenditures	-.0143553	.0426288	.0437132
Data Processing Expenditures	-.0144773	.0341119	.0367557
Community Services Expenditures	-.0808751**	.0369581	.0385024
Debt Service Expenditures	.0092948	.0255276	.0244423
Capital Outlay Expenditures	-.0774578**	.0295222	.0300742
Total Enrollment Count	.2338342***	.077043	.080781
Economically Dis. (Percent)	-.0281436***	.0032912	.0035738

* p < .10, ** p < .05, *** p < .01

ordered logit regression were similar to both the findings in 2008-09 and 2009-10. As in both years, there was a negative, statistically significant relationship between instructional expenditures, instructional related services, student support services, and community services expenditures per pupil. Also as with both prior years, there was a positive relationship between district size and FAST rating, while a negative relationship existed between the percent of students who were economically disadvantaged and efficiency. As with the findings in 2009-10, there was once again a negative, statistically significant relationship between plant maintenance and operation expenditures and FAST rating. New to the findings in 2010-11 was that expenditures in capital outlay—generally used for the purchase of new property or major improvements to school sites—were found to have a negative effect on FAST rating. As in 2008-09 and 2009-10, the Chi-squared test showed a probability of having a greater Chi-squared statistics as 0.00. See **Table 14**.

Multiyear FAST Data Analyses

Up to this point, the FAST data analyses had consisted of 3 one-year snapshots of FAST data. It became important to verify whether the findings in the snapshots would hold over the 3-year span of the FAST. As a result, the data were pooled and an ordered logit was once again run for the total operating expenditures per pupil and the 15 functions of spending used by schools in Texas. By pooling the data, it is possible to restrict the coefficient to be the same for each year, thereby allowing the average effect of each independent variable to be measured.

In order to increase the validity of the findings, a school year dummy variable was created to transform all the data to deviations from the state average on FAST rating for each year. Year dummy variables allowed for a level shift each year. It was assumed that certain costs were expected to increase each year due to inflation and other factors. By inserting a dummy variable into the ordered logistic regression, the relationship between increased spending due to inflation was controlled. Data from 2008-09 were omitted in the dummy variable calculations to account for collinearity.

In the ordered logit analysis for total operating expenditures per pupil, it was found that there was a negative, statistically significant relationship ($p < .01$) between total expenditures and FAST rating. Districts which spend more than the state average were found to have lower FAST ratings than districts which spend less. The results for each of the three years of data were mixed with regards to the relationship between district size and FAST rating. 2008-09 showed a positive relationship. 2009-10 showed no statistical significance in the relationship, while 2010-11 had a negative relationship. Therefore, it was not surprising to find that the three year analysis presented no statistically significant relationship between size and FAST rating. Also not surprising

Table 15:
Ordered Logit Model of Total Expenditures per Pupil, 2008-2011

	Coefficient	Standard Error	Robust Standard Error
Total Expenditures per Pupil	-2.857544***	.1683311	.1729298
Total Enrollment Count	-.0209049	.0234284	.0246717
Economically Dis. (Percent)	-.0218635***	.0016342	.0017863
School Year 2	.133227*	.0742627	.0749245
School Year 3	.2299214***	.0746284	.0747662

* $p < .10$, ** $p < .05$, *** $p < .01$

was to find that the percent of students who were economically disadvantaged continued to have a negative, statistically significant relationship. See **Table 15**.

After the analyses for total operating expenditures were completed, an ordered logit was completed for the 15 functions of spending. As was expected, the 4 functions of spending which were consistently found as being negative—instructional expenditures, instructional leadership, student support services, and community services—across each of the single years of FAST ratings were once again seen to be a negative predictor of efficiency. Other expenditures such as capital outlay and data processing, which were seen as significant in only one of the years, were found to be

Table 16:
Ordered Logit Model of Expenditures by Function, 2008-2011

	Coefficient	Standard Error	Robust Standard Error
Instructional Expenditures	-.7046722***	.2284464	.237678
Instr. Related Expenditures	-.1161007**	.0505946	.0556699
Instr. Leadership Expenditures	-.0870272***	.0173178	.0174896
School Leadership Expenditures	-.0349326	.0903387	.0824162
Support Services Expenditures	-.1863871***	.0402334	.0419378
Transportation Expenditures	.0157547	.0308597	.0363745
Food Services Expenditures	.0564497	.1014452	.1168365
Cocurricular Expenditures	-.1453168***	.0378477	.0437011
Central Administrative Expenditures	.0790168	.1013699	.1077034
Plant Maintenance Expenditures	-.7188001***	.1176188	.1365209
Security Expenditures	-.0073722	.0251014	.0255407
Data Processing Expenditures	-.0375511*	.0194161	.0227407
Community Services Expenditures	-.0675583***	.0217903	.0227407
Debt Service Expenditures	.0025925	.0149724	.0143021
Capital Outlay Expenditures	-.037421**	.016843	.0170515
Total Enrollment Count	.2921458***	.0462208	.0494813
Economically Dis. (Percent)	-.0270173***	.0019924	.002814
School Year 2	.1044976	.0760989	.076953
School Year 3	.170989**	.0769716	.077429

* p < .10, ** p < .05, *** p < .01

negatively significant over the three year span of data. District size was found to have a positive impact on FAST rating, while the percent of economically disadvantage students was again found to be negatively correlated with FAST rating. There were, however, two functions which were not shown to have a statistically significant impact in any individual year that were shown to have a statistically significant impact over the three years of FAST data. Instructional related expenditures, which include costs for librarians and professional development, was shown to have a negative impact on FAST rating ($p < .05$). Cocurricular activities—which includes athletics—were also found to have a negative, statistically significant ($p < .01$) effect on efficiency. As with the individual year analyses, the Chi-squared test yielded a probability of having a greater Chi-squared statistics as 0.00. See **Table 16**.

Though it was hoped to be able to find functions which positively impact FAST rating, these findings were significant in that they could guide practicing administrators and superintendents to find specific functions in the budget that might be reduced and have a minimal impact on efficiency. These findings are also consistent with the findings of Andrews, Duncombe, and Yinger (2002) who found that there are potential cost savings in instructional costs for relatively larger districts. These findings also support the work of Ray (1991) who found that districts with high numbers of low-socioeconomic students are less efficient.

Linear Specification of Spending by Function

After completing the ordered logistic regression using logarithmic terms, it was decided the same ordered logistic regression would be completed using actual dollars per pupil in each of the spending functions used by school districts.[3] By using actual dollars rather than the logarithms of each dollar, it became easier to analyze the effect of moving money from one function to another function.

By using a linear specification, one could clearly see that removing money from districts as a whole created greater efficiency. However, this model also indicated that certain functions had a greater negative impact on efficiency than did others because these functions had a greater negative coefficient. For example, the coefficient for Community Service was -.0014427 while the coefficient of Instruction was -.0000835. This finding indicated that, while both were negatively correlated to efficiency, cutting expenditures in Community Service would result in a greater increase in efficiency than would cutting the same amount in Instruction. The same could be said for Instructional Related Services, School Leadership, Student Support Services, Cocurricular Services, Plant Maintenance and Operations, Data Processing, and Capital Outlay. In fact, the only areas where a positive correlation occurred between actual dollars per pupil and efficiency was in the functions of Administration and Debt Services. This finding was likely the resulted from larger districts, which tend to be more efficient than do smaller districts, have greater administrative costs than do smaller districts. See **Table 17**.

[3] It is worth mentioning that the "goodness of fit" results indicated that the logarithmic model yielded a higher result (-6435) than did the linear model (-6652). However, the linear model was included because it may yield more applicable information for practicing administrators than would a logarithmic model alone.

Table 17:
Ordered Logit Model of Linear Expenditures by Function, 2008-2011

	Coefficient	Standard Error	Robust Standard Error
Instructional Expenditures	-.0000835**	.0000373	.0000408
Instr. Related Expenditures	-.0013685***	.0002452	.0002597
Instr. Leadership Expenditures	-.0020247***	.003168	.0004774
School Leadership Expenditures	-.0003158*	.0001791	.0001894
Support Services Expenditures	-.000785***	.0001773	.0002514
Transportation Expenditures	.0002606	.0001865	.0002219
Food Services Expenditures	-.0002355	.0002478	.000257
Cocurricular Expenditures	-.0006532***	.0001698	.0001804
Central Administrative Expenditures	.0002415**	.0000867	.0001056
Plant Maintenance Expenditures	-.0002348***	.0000603	.0000883
Security Expenditures	.0011919	.0010048	.0010258
Data Processing Expenditures	-.000458*	.0002346	.000238
Community Services Expenditures	-.0014427*	.0006793	.0008293
Debt Service Expenditures	.0000792**	.0000317	.0000311
Capital Outlay Expenditures	-.0000185**	.000001	.0000001
Total Enrollment Count	.1979113***	.0329346	.0352035
Economically Dis. (Percent)	-.0234529***	.0019675	.0021181

* p < .10, ** p < .05, *** p < .01

For practicing administrators, there are two ways to interpret the linear regression shown in Table 17. One way to interpret the results is to consider where one might cut money in the budget in order to increase efficiency. Suppose dollars had to be cut from the budget from a specific function. By analyzing the coefficients from Table 17, district leaders can see which functions are most inefficient, thereby allowing district leaders to pull money from those functions first.

Another interpretation of the results of the linear regression would allow district leaders to know where best to spend money. If one were to imagine a scenario where districts leaders would be able to pull resources from one function and place the same resources into another function, then knowing the coefficients of those two functions would aid in the decision making. For example, pulling money from Instruction and putting the money into Administration would increase efficiency because the coefficient for Administration is less negative than the coefficient for Instruction. A Chi-squared test completed for such a scenario was completed and the probability of having a greater Chi-squared is 0.0076. Therefore, one can reject the hypothesis that there is no difference in spending on Instruction versus spending in Administration.

This information could be invaluable to district leaders who are forced to make cuts but are unsure as to where the cuts should be made. If given the option of cutting costs in Cocurricular spending versus Capital Outlay, it would be better to cut in Cocurricular than it would be in Capital Outlay because the negative coefficient in Cocurricular is greater than the negative coefficient in Capital Outlay. This information could also help district leaders in making personnel decisions. If given the option of hiring an additional assistant principal or an additional curriculum specialist, district leaders should choose to hire an assistant principal because spending in the area of Administration is more efficient than spending on Instructional Leadership.

Program Expenditures as a Predictor for Efficiency

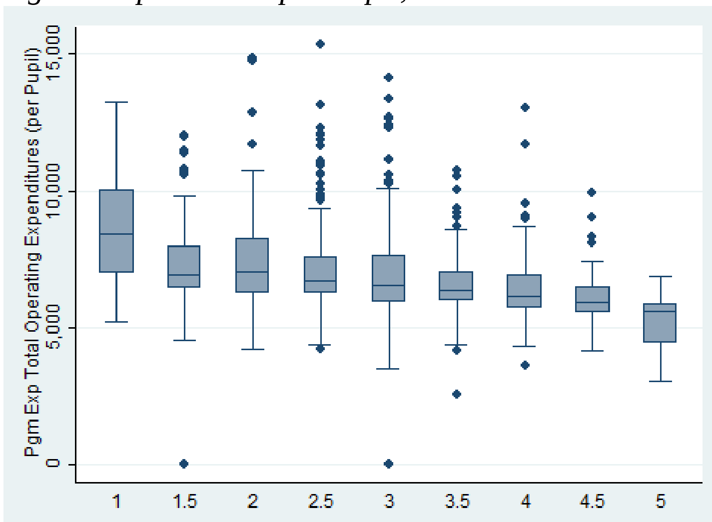
As noted in Chapter 2, there is a great deal of both academic and political controversy regarding to what extent school districts should be spending their money on instruction (Center for Public Policy Priorities, 2005). It was therefore necessary to take an in-depth look at instructional programs such as Regular Education, Special Education, Career and Technology Education, and others to determine if spending in these specific programs can be used as a predictor of FAST efficiency. Unlike the review of total expenditures per pupil, which looked at spending at the function level, the analyses on Total Operating Expenditures by Program focused on specific programs which may affect efficiency. As defined by the Texas Education Agency, Total Operational Expenditures by Program are actual operating expenditures for groups of program categories. This analyses was important due to the fact that many of the instructional programs receive direct funding from the state and are an aspect of the weighted daily average attendance used to fund school districts and charter schools.

2008-2009 Data Analyses

Using 2008-2009 data, analyses of the relationship between instructional program spending per pupil and a district's efficiency as measured by the FAST were completed. In 2008-2009, 1,131 districts and charter schools rated by FAST showed expenditures in instructional spending. Those districts were analyzed using both univariate and multivariate methods.

As with spending by function, the districts and charter schools were divided into each of the 9 categories of the FAST for analyses. Prior to the analyses, a box and whisker plot was completed to determine if any outliers existed. Statistically, observations above or below 5 standard deviations could be considered outliers. The data showed that any observations above $14,961 per student could be considered outliers and were removed from the data. There was one observations above $14,961 which was removed, as well as 3 observations at $0 which were removed, leaving a total of 1,127 districts and charter schools for analysis. See **Figure 6**.

Figure 6:
Instructional Program Expenditures per Pupil, 2008-2009



The data showed only one group—1-star rated districts and charter schools—to have a mean spending on instruction above $8,000 per pupil. The data also revealed that the mean spending per pupil went down as the FAST rating went up. Though there was

Table 18:
Instructional Program Expenditures per Pupil, 2008-2009

FAST Rating	# Obs	Mean	Standard Deviation	Min.	Max
All	1,131	$6,824	1628.018	$0	$15,348
1-star	24	$8,627	2151.085	$5,201	$13,223
1.5-star	82	$7,427	1634.594	$4,543	$12,039
2-star	145	$7,639	1692.051	$4,178	$14,858
2.5-star	200	$7,101	1549.572	$4,188	$13,124
3-star	223	$6,936	1695.009	$3,497	$14,114
3.5-star	186	$6,530	1132.358	$2,569	$10,751
4-star	138	$6,402	1261.577	$3,604	$13,002
4.5-star	86	$6,092	960.8883	$4,167	$9,921
5-star	43	$5,259	940.1481	$3,019	$6,863

Table 19:
Distribution of Instructional Program Expenditures per Pupil, 2008-2009

FAST Rating	Coefficient	Robust Standard Error
1-star	8627.208***	300.4196
1.5-star	-1200.696***	341.5658
2-star	-1258.091***	324.3304
2.5-star	-1526.548***	317.9343
3-star	-1691.63***	316.1727
3.5-star	-2097.112***	319.2137
4-star	-2225.216***	325.4965
4.5-star	-2535.255***	339.7625
5-star	-3368.092***	375.0002

* $p < .10$, ** $p < .05$, *** $p < .01$

no consistent pattern observed in the minimum and maximum amount in spending per pupil. See **Table 18**.

Once the measures of central tendency were computed, a regression analysis was done to test for the differences in the means using robust standard error. Statistically significant differences between the relationships of the coefficient values of the different FAST categories was found in each of the categories, with 7 of the 9 categories being statistically significant at the .01 level. This finding indicates that as instructional spending decreases, FAST rating increases, so districts and charter schools which spend less on instruction per pupil actually rate better through FAST. This finding is contradictory to research (Cullen, Jones, & Slate, 2011) and informal assertions that schools which increase instructional expenditures perform better. See **Table 19**.

Upon completing the regression analyses, an ordered logit regression was performed in order to control for the size and the economic make-up of the districts and charter schools. Unlike the simple test of the difference in means presented in the

Table 20:
Ordered Logit Model of Total Instructional Expenditures by Program, 2008-2009

	Coefficient	Standard Error	Robust Standard Error
Total Instructional Expenditures	-2.765692***	.2825277	.3090558
Total Enrollment Count	.0933332***	.0382716	.0413502
Economically Dis. (Percent)	-.0214165***	.0027749	.0030802

* p < .10, ** p <.05, *** p < .01

regression analysis, the ordered logit no longer indicated a negative, statistically significant relationship between total instructional spending by program and the FAST rating. As with operational expenditures by function, there existed a statistically significant positive relationship between district size and FAST rating and a negative, statistically significant relationship between the percent of students who were economically disadvantaged and FAST rating. See **Table 20**.

After reviewing the total expenditures by program, an in-depth look into each of the 8 program categories was completed. The ordered logistic regression showed that

Table 21:
Ordered Logit Model of Instructional Expenditures by Program, 2008-2009

	Coefficient	Standard Error	Robust Standard Error
Regular Education	-.4229918**	.1738872	.1953203
Special Education	-.510392***	.1015912	.1245545
Accelerated Instruction	-.4316952***	.0945308	.1254884
Gifted and Talented	-.123184**	.0484706	.049051
Career and Technology	-.0006665	.0425201	.0443305
Bilingual/ESL	.1997752***	..0362302	.0373653
Athletics	-.0338478	.0453969	.0451172
Other	-.1050823***	.0309889	.0310497
Total Enrollment Count	.2101605***	.0523184	.0576156
Economically Dis. (Percent)	-.0215128***	.003768	.0042263

* p < .10, ** p <.05, *** p < .01

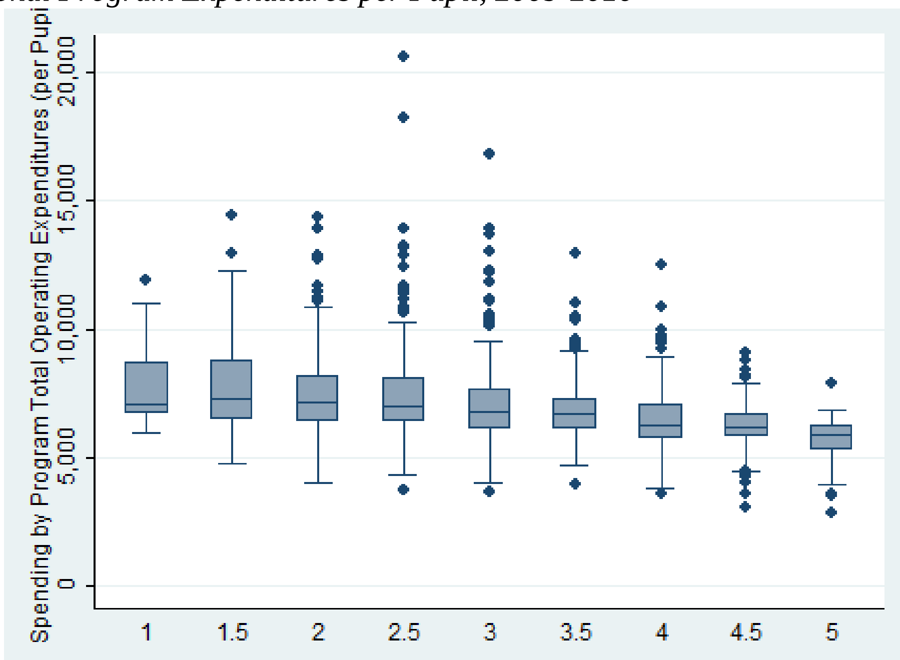
there were 5 programs which were negatively associated with efficiency—regular education, special education, accelerated instruction, gifted and talented, and other—which means that as spending in those programs increased, the efficiency of a district or charter school decreased. There was one program which showed a positive relationship to efficiency, spending in Bilingual/ESL. As with total program expenditures, there existed a positive relationship between district size and FAST rating and a negative relationship between the percent of students who were economically disadvantaged and FAST rating. This finding is consistent with the research of others (Duncombe, Miner, & Ruggiero, 1997) that showed schools with high rates of poverty, students at-risk, and students in special education are less efficient than other schools. The Chi-squared test showed that the probability of having a greater Chi-squared test statistic is 0.00. As a result, one can reject that hypothesis that Expenditures by Program are irrelevant. See **Table 21**.

2009-2010 Data Analysis

After analyzing the 2008-2009 data, data from the 2009-2010 FAST report were analyzed to determine if results were consistent with the prior analysis of the relationship between instructional spending by program and FAST rating. In 2009-2010, the data showed that 1,138 districts and charter schools were analyzed for the FAST report with an average total spending by program per pupil was $7,604. As with each of the prior analyses, a box-and-whisker plot was prepared to determine outliers. After the completion of the box-and-whisker plot, it was determined that districts with instructional spending of greater than $15,635 were more than 5 standard deviations

Figure 7:

Instructional Program Expenditures per Pupil, 2009-2010



above the mean and were removed as outliers. A total of 3 districts and charter schools were removed, leaving a total of 1,135 observations for analyses. See **Figure 7**.

The data were sorted into each of the 9 categories of the FAST to determine the measures of central tendency in each category. As with the 2008-2009 data, the measures of central tendency showed that as districts increased in their FAST rating, total spending by program decreased. 5-star districts had a mean value of instructional program spending per pupil that was over $2,000 less per pupil than did 1-star districts and over $500 less per student than 4-star districts. The only exception was the 1.5-star districts spent more on instructional programs than did 1-star districts. See **Table 22**.

Table 22:
Instructional Program Expenditures per Pupil, 2009-2010

FAST Rating	# Obs	Mean	Standard Deviation	Min.	Max
All	1,138	$7,065	1714.235	$2,804	$20,614
1-star	37	$7,679	1462.304	$5,952	$11,928
1.5-star	89	$7,802	1813.589	$4,736	$14,442
2-star	142	$7,561	1795.573	$3,997	$14,365
2.5-star	197	$7,387	1722.077	$3,733	$13,901
3-star	217	$7,095	1583.367	$3,637	$13,931
3.5-star	163	$6,871	1265.883	$3,543	$12,528
4-star	140	$6,525	1332.268	$3,543	$12,528
4.5-star	104	$6,192	1022.215	$3,022	$9,087
5-star	46	$5,644	966.7292	$2,804	$7,852

Once the measures of central tendency were calculated, a regression analysis was performed to test for differences within the means of the categories using robust standard errors as measures. During the regression analysis, a statistically significant relationship was found for 3-star districts (p<.05) and for 4-, 4.5-, and 5-star (p<.01) districts and charter schools. However, unlike 2008-09 data which showed statistically significant

Table 23:
Distribution of Instructional Program Expenditures per Pupil, 2009-2010

FAST Rating	Coefficient	Robust Standard Error
1-star	7679***	249.8035
1.5-star	122.6067	297.2274
2-star	-117.7535	280.4665
2.5-star	-291.7462	272.2535
3-star	-584.2627**	270.2624
3.5-star	-808.4724***	276.7068
4-star	-1153.529***	280.8803
4.5-star	-1487.308***	290.865
5-star	-2035.304***	335.5511

* $p < .10$, ** $p < .05$, *** $p < .01$

Table 24:
Ordered Logit Model of Total Instructional Expenditures by Program, 2009-2010

	Coefficient	Standard Error	Robust Standard Error
Total Instructional Spending	-2.729025***	.2761721	.2871821
Total Enrollment Count	.0386079	.0374927	.0392873
Economically Dis. (Percent)	-.024632***	.0028045	.0029582

* p < .10, ** p <.05, *** p < .01

differences between each of the 9 categories, 2009-10 data did not show a statistically significant difference between 1.5-, 2-, and 2.5 star districts and charter schools. See **Table 23**.

In order to control for both the size of school and the percent of students which were economically disadvantaged, an ordered logit was conducted. When controlling for both size and wealth, the data indicate there is negative, statistically significant relationship between total instructional expenditures by program and FAST rating. There continued to be a negative relationship between the percent of students who were economically disadvantaged and efficiency. However, unlike the previous year, there was no significance between size and rating. See **Table 24**.

As with 2008-09, instructional programs were analyzed using an ordered logistic regression. There were several differences seen in the results. To begin, spending in Regular Education was no longer seen to be a significant predictor of FAST rating. However, spending in Special Education, Accelerated Instruction, Gifted and Talented, and Other all remained negatively correlated with efficiency. Like 2008-09 data, spending in the program area of Bilingual/ESL continued to be positively related to FAST rating. Unlike the previous year, spending in Career and Technology Education

Table 25:
Ordered Logit Model of Instructional Program Expenditures, 2009-2010

	Coefficient	Standard Error	Robust Standard Error
Regular Education	-.6463406	.230267	.4519041
Special Education	-.3457939***	.1071857	.1267138
Accelerated Instruction	-.3721555**	.1133804	.1567894
Gifted and Talented	-.1220221**	.048851	.04937
Career and Technology	-.076304*	.0428356	.0451824
Bilingual/ESL	.059568***	.0197213	.0201834
Athletics	.0090882	.0459757	.0458445
Other	-.1536984***	.0320227	.033728
Total Enrollment Count	.1866707***	.0610177	.0700974
Economically Dis. Percent	-.0242766***	.0042293	.0048814

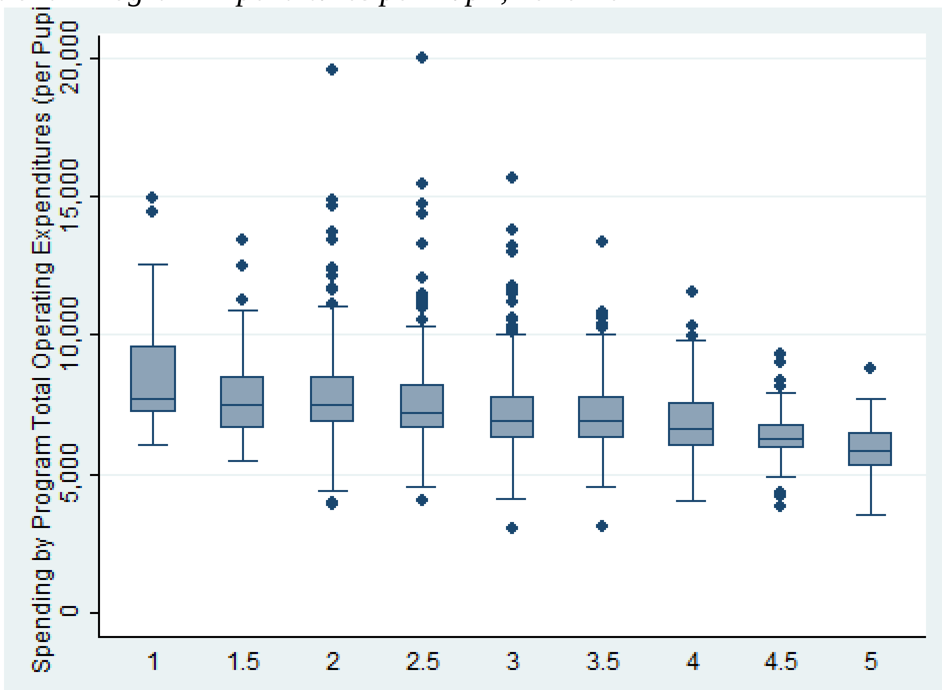
* $p < .10$, ** $p < .05$, *** $p < .01$

was found to be statistically significant ($p < .10$). As had been seen for all analyses to this point, total enrollment count of a district or charter schools was positively correlated to FAST rating while the percent of students who were economically disadvantaged continued to display a negative, statistically significant relationship with FAST efficiency. The Chi-squared test once again revealed that the probability of having a greater Chi-squared statistic is 0.00. See **Table 25**.

2010-2011 Data Analyses

After the completion of the analyses for both 2008-2009 and 2009-2010, analyses of the 2010-2011 FAST data was completed to verify the findings of the two previous years. A similar method was used, starting with the determination of outliers and then moving forward with both univariate and multivariate analyses. 2010-2011 data showed 1,136 districts and charter schools reported expending money on instruction. A box and whisker plot was created to help determine if any outliers existed within the

Figure 8:
Instructional Program Expenditures per Pupil, 2010-2011



data. It was decided that school districts and charter schools which spent over $15,911 per pupil on instructional program expenditures were above 5 standard deviation limit used to determine outliers and were removed from the data. A total of 2 outliers were removed. See **Figure 8**.

Once the outliers were established and removed from the data, the data were divided into the 9 categories of the FAST for analyses. The measures of central tendency were calculated and it was found that 1-star districts spend the greatest amount per pupil at $8,664 while 5-star districts spend almost $1,400 less per pupil at an average of $5,919. 1.5-star districts spent slightly less per student ($7,809) than did 2-star districts, while mean spending went down from 2.5- to 5-star districts. Overall, as instructional

Table 26:
Instructional Spending per Pupil, 2010-2011

FAST Rating	# Obs	Mean	Standard Deviation	Min.	Max
All	1,136	$7,308	1720.638	$3,023	$19,985
1-star	35	$8,664	2229.818	$6,066	$14,963
1.5-star	95	$7,809	1466.532	$5,459	$13,416
2-star	135	$7,909	1893.918	$3,875	$14,878
2.5-star	189	$7,619	1709.094	$4,042	$15,453
3-star	229	$7,240	1691.009	$3,023	$15,674
3.5-star	166	$7,175	1346.215	$3,116	$13,327
4-star	143	$6,816	1203.097	$4,016	$11,553
4.5-star	97	$6,389	944.0799	$3,826	$9,343
5-star	45	$5,919	992.2427	$3,554	$8,773

program spending per pupil went down, the FAST rating of districts and charter school increased. See **Table 26**.

Once the measures of central tendency were calculated, a regression analysis was conducted to determine if there was any statistical significance in the results. The regression showed that a negative, statistically significant relationship existed between each of the categories of the FAST and 1-star districts. In fact, there was a strong, negative correlation ($p < .01$) in each of the categories except for 2-star districts, which had a significant relationship at the $p < .10$ level. See **Table 27**.

Once the regression confirmed a statistically significant relationship did occur between instructional spending and FAST rating, an ordered logit was completed to see which factors it total instructional program expenditures had a significant relationship with FAST rating. Data showed that both total instructional program expenditures and the percent of students who were economically disadvantaged had a negative, statistical significant relationship with FAST rating. However, in 2010-11 there was no statistical

Table 27:
Distribution of Instructional Program Expenditures by FAST Rating, 2010-2011

FAST Rating	Coefficient	Standard Error
1-star	8664.029***	261.2027
1.5-star	-855.3023***	305.5537
2-star	-754.9841**	293.1131
2.5-star	-1044.981***	284.3615
3-star	-1423.614***	280.4542
3.5-star	-1488.914***	287.4231
4-star	-1848.49***	291.4202
4.5-star	-2274.606***	304.7045
5-star	-2745.229***	348.2703

* p < .10, ** p < .05, *** p < .01

significance with the size of district when analyzing instructional program expenditures. These findings were the same as in 2009-10. See **Table 28**.

As in 2008.09 and 2009-2010, there was a strong (p < .01) negative, statistically significant relationship between spending with spending on special education, accelerated instruction, and other programs, as well as a strong negative, statistically significant correlation between the percent of low-SES students and FAST rating. Though spending on regular education services was still found to be statistically significant, the negative correlation was only found at the p < .05 level. Spending on gifted and talented programs was also negatively correlated to FAST rating at the p < .10

Table 28:
Ordered Logit Model of Total Instructional Expenditures by Program, 2010-20011

	Coefficient	Standard Error	Robust Standard Error
Total Instructional Spending	-2.805502***	.2851739	.3016623
Total Enrollment Count	.0022839	.0377269	.0395895
Economically Dis. (Percent)	-.0263205***	.0028283	.0030702

* p < .10, ** p <.05, *** p < .01

Table 29:
Ordered Logit Model of Instructional Expenditures by Program, 2010-2011

	Coefficient	Standard Error	Robust Standard Error
Regular Education	-.9904084**	.2493422	.4682882
Special Education	-.4300491***	.1079745	.133839
Accelerated Instruction	-.577037***	.132874	.216873
Gifted and Talented	-.0817984*	.0476476	.046563
Career and Technology	-.0174108	.046303	.0530554
Bilingual/ESL	.1329784***	.035604	.0367115
Athletics	-.0550674	.0511114	.0561344
Other	-.1422***	.0315751	.031909
Total Enrollment Count	.1078259	.0535205	.0668469
Economically Dis. Percent	-.0227997***	.0046059	.0061086

* p < .10, ** p < .05, *** p < .01

level. Also similar to the previous data, spending on Bilingual/ESL programs continued to show a positive relationship. These findings were similar to the research of Chaikind, Danielson, and Brauen (1993) which found special education students cost and average of 2.3 times more to educate than regular education students. Also, the number of students enrolled in a school district or charter school no longer showed a statistically significant relationship. The Chi-squared test presented the probability of having a great Chi-squared test statistic as 0.00. See **Table 29**.

Multiyear FAST Data Analyses

The final step in the process was to pool all three years' worth of FAST data and analyze the effect of spending instructional program expenditures and FAST rating. As expected, the ordered logistic regression showed that total expenditures per pupil by program was negatively correlated with FAST rating ($p < .01$) while the percent of

Table 30:
Ordered Logit Model of Total Instructional Expenditures by Program, 2008-20011

	Coefficient	Standard Error	Robust Standard Error
Total Instructional Spending	-2.679648***	.1598938	.1707636
Total Enrollment Count	.0437559*	.0218449	.023189
Economically Dis. (Percent)	-.0241479***	.0016159	.0017488
School Year 2	.1582909**	.0743209	.0749202
School Year 3	.2521273***	.074784	.0746792

* p < .10, ** p <.05, *** p < .01

students who were economically disadvantaged continued to display a negative correlation with FAST efficiency. Though two of three years did not show that district size had a statistically significant impact on FAST rating when analyzing program expenditures, the three-year analysis did conclude that district size was positively associated with FAST rating. See **Table 30**.

When analyzing specific programs, the results showed that a majority of programs—5 of 8—were negatively correlated with FAST rating. Spending on Regular Education, Special Education, Accelerated Instruction, Gifted and Talented, and Other program expenditures were found to have a strong ($p < .01$) negative relationship with FAST rating. These findings suggested that efficient districts spend less on these programs than did less efficient districts. However, as was seen in all three individual years, Bilingual/ESL Education programs continued to show a positive, statistically significant relationship with FAST rating, suggesting that Bilingual and ESL programs were an efficient use of district funds. This finding seemed to support the work of De Jong (2002) which found that effective bilingual education programs improve academic

Table 31:
Ordered Logit Model of Instructional Expenditures by Program, 2008-2011

	Coefficient	Standard Error	Robust Standard Error
Regular Education	-.586032**	.1305938	.2408856
Special Education	-.3688154***	.0657739	.0792772
Accelerated Instruction	-.2758776***	.0585533	.0705793
Gifted and Talented	-.1261228***	.0276451	.0274126
Career and Technology	-.0398606	.0251224	.0268652
Bilingual/ESL	.1433721***	.0205287	.0211639
Athletics	-.0317672	.0272584	.0280775
Other	-.1301225***	.0181563	.0183576
Total Enrollment Count	.2264379***	.0296096	.034941
Economically Dis. Percent	-.0301342***	.0020496	.0022279
School Year 2	.0963328	.0744888	.0756256
School Year 3	.1644075**	.074363	.074442

* p < .10, ** p < .05, *** p < .01

achievement of second language learners. Spending in the areas of Career and Technology Education and Athletics were not found to be statistically significant. Finally, the ordered logit analysis found that larger schools were positively related to FAST rating and that districts and charter schools with high numbers of economically disadvantaged students continued to be negatively correlated with efficiency. As with all three individual year analysis, the Chi-squared test indicated that the probability of having a great Chi-square test statistic is 0.00. See **Table 31**.

District Size as a Predictor of Efficiency

Due to the number of studies (Andrews, Duncombe, Yinger, 2002; Deller and Rudnicki, 1993; Duncombe, Miner, & Ruggerio, 1997) which have found that the size of a school district had an impact on its efficiency, it became important to look at school district size as a predictor of FAST efficiency. Student enrollment numbers, along with the number of students within a district broken down by ethnic group were used as variables in for analysis. Analyses included both univariate and multivariate methods for each of the three years of FAST data and analyses of pooled data from FAST.

2008-2009 Data Analyses

In the 2008-2009 school year, there were approximately 4,728,204 students enrolled in public school districts and charter schools in Texas. FAST data showed ratings for 1,131 school districts and charter schools. The average size for districts and charter schools rated by the fast was 4,148 students with the smallest district in the state having an enrollment of 38, while the largest had an enrollment of 199,524. A box and whisker plot was created to see visualize the distribution of district enrollment across each of the categories of the FAST. The plot showed that the widest distribution of

Figure 9:
District Size, 2008-2009

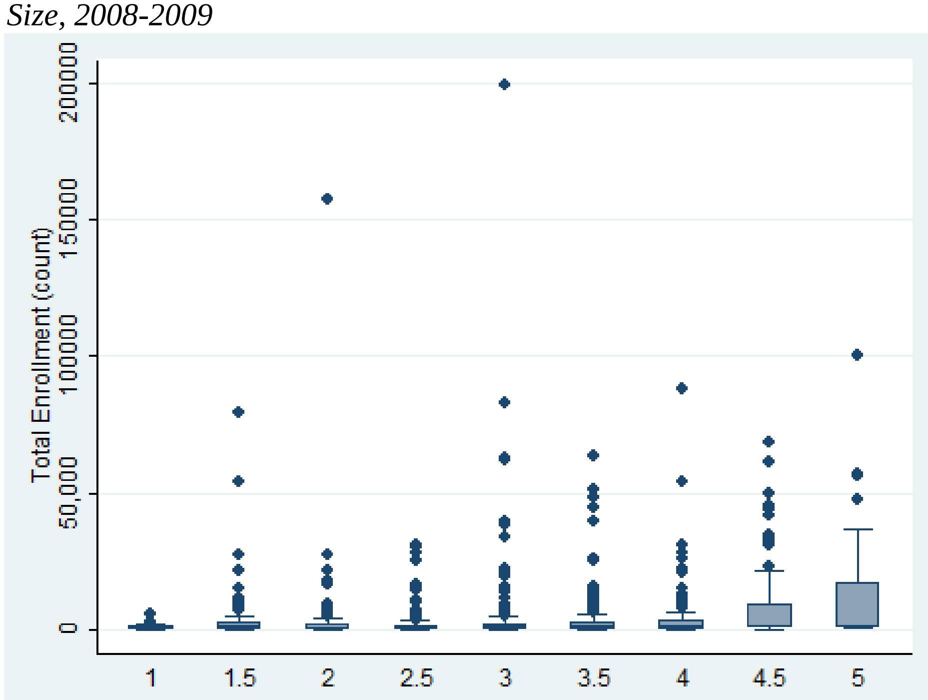


Table 32:
District Size by FAST Rating, 2008-2009

FAST Rating	# Obs	Mean	Standard Deviation	Min.	Max
All	1,131	4,147	12263.37	38	199,524
1-star	24	1,113	1514.43	80	5,419
1.5-star	83	4,184	11102.24	41	79,114
2-star	144	1,989	3934.033	49	27,230
2.5-star	201	2,063	4503.17	38	30,647
3-star	224	3,513	9726.112	47	83,033
3.5-star	186	3,610	8612.184	37	63,189
4-star	138	3,946	9960.281	88	88,201
4.5-star	86	8,500	14578.48	94	68,507
5-star	43	12,216	21328.84	276	100,505

district size came with 5-star rated districts and that the smallest distribution came with 1-star districts. The box and whisker plot also enabled the researcher to determine any outliers were present in the data. It was decided that there were two school districts with enrollment numbers that could clearly be considered outliers—Dallas and Houston ISD—and were removed from the data set. See **Figure 9**.

Once the box and whisker plot was completed and the outliers were removed, the measures of central tendency were calculated across each of the 9 categories of the FAST. The data showed that 4.5- and 5-star districts had the highest mean of all the categories while 1-star districts had the lowest mean. Overall, district enrollment increased as FAST rating increased with the exception of 1.5-star districts, which had the third highest mean enrollment behind only the 4.5- and 5-star districts. See **Table 32**.

In order to determine if there was a statistically significant difference between the categories, a regression analysis was completed. The regression showed no

Table 33:
Distribution of Total Enrollment by FAST Rating, 2008-2009

FAST Rating	Coefficient	Robust Standard Error
1-star	1112.958	1948.068
1.5-star	3071.09	2211.856
2-star	876.2708	3104.154
2.5-star	950.3501	2061.092
3-star	2400.229	2049.774
3.5-star	2497.02	2069.937
4-star	2833.136	2110.68
4.5-star	7386.716***	2203.186
5-star	11103.44***	2431.684

* $p < .10$, ** $p < .05$, *** $p < .01$

statistically significant relationship existed between any of the categories except for 4.5- and 5-star districts. The statistical significance in those two categories was at the $p < .01$ level. See **Table 33**.

After completing a regression analysis, an ordered logit regression was calculated to control for a variety of student characteristics which encompassed total enrollment. In addition to the total enrollment, the ethnicities of students were included as variables within the OLS regression, as well as the percentage of students who were economically disadvantaged. The data showed that a statistically significant, positive relationship existed between both total enrollment ($p < .01$) and the percent of African American students ($p < .05$), the percent of Asian/Pacific Islanders ($p < .01$), and the percent of students who were Hispanic ($p < .10$) within a district. The only ethnic group that did not show a statistically significant relationship was the percentage of White students within a district. These findings suggested that overall district size, regardless of the ethnic makeup, was the most important demographic predictor of efficiency. This finding is

Table 34:
Ordered Logit Model of Total Enrollment and District FAST Rating, 2008-2009

	Coefficient	Standard Error	Robust Standard Error
Total Enrollment	.1716884***	.0387978	.0399551
African American (Percent)	.0667568**	.0469896	.0314193
Asian/Pacific Islander (Percent)	.1084298***	.0469365	.039864
Hispanic (Percent)	.0526503*	.051411	.0313705
White (Percent)	.0493425	.0473591	.0316463
Economically Dis. (Percent)	-.0282352***	.0042308	.0042584

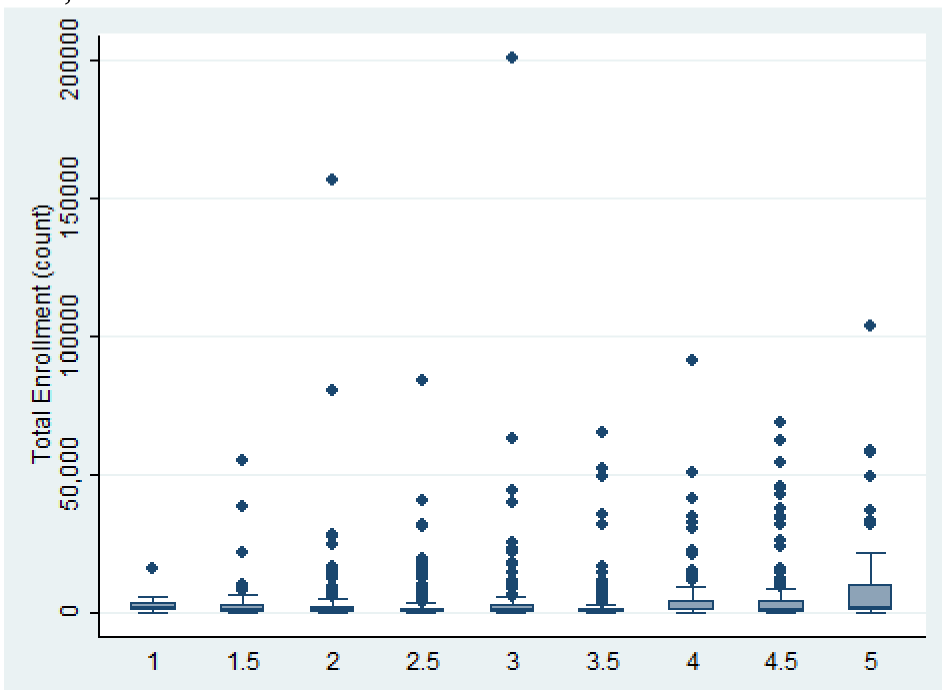
* $p < .10$, ** $p < .05$, *** $p < .01$

consistent with the research of Andrews, Duncombe, and Yinger (2002) and Deller and Rudnicki (1993)which found that as enrollment goes up the relative efficiency of a district increased. There was also a statistically significant, negative relationship between the percentage of students who were economically disadvantaged and a district's FAST rating. Again, this finding is consistent with Ruggiero (1996) that found that students whose parents had a higher education level—which are less likely to be economically disadvantaged—performed better than districts with a higher percentage of economically disadvantaged students. The Chi-squared test confirmed that the probability of having a greater Chi-squared test statistic is 0.00. See **Table 34**.

2009-2010 Data Analyses

After completing the analyses of 2008-09 FAST data, the data from 2009-10 FAST were inputted for analysis. In 2009-10, there were 4,824,778 students being educated in 1,138 school districts and charter schools. The average size for school districts and charters was 4,209 students with the smallest district or charter school in Texas having an enrollment of 23 and the largest with an enrollment of 200,944.

Figure 10:
District Size, 2009-2010



Before conducting and analysis of the measures of central tendency for the 2009-2010 FAST data, a box and whisker plot was generated to determine if any outliers existed within the data. After completing the box and whisker plot, it was decided that, once again, the two largest districts in the state could be considered outliers and were therefore removed from the data. See **Figure 10**.

After removing the outliers, districts were divided into each of the 9 categories of the FAST and the measures of central tendency were calculated. In 2009-10, the category with the most observations were 3-star districts, which had 217 districts and charter schools. The category with the lowest number of observations were 5-star districts with 43. The mean values of 1-star districts through 3.5-star districts ranged

Table 35:
District Size by FAST Rating, 2009-2010

FAST Rating	# Obs	Mean	Standard Deviation	Min.	Max
All	1,138	4,209	12408.03	23	200,944
1-star	37	2,583	2801.689	101	15,538
1.5-star	89	2,946	7404.515	42	55,086
2-star	141	3,031	8330.461	23	80,103
2.5-star	199	2,630	7774.911	36	84,245
3-star	217	3,119	7866.574	59	63,385
3.5-star	163	3,142	8492.302	95	65,217
4-star	140	4,916	10911.62	86	91,464
4.5-star	104	7,043	14248.97	124	69,066
5-star	46	11,161	20697.39	154	103,897

between 2,583 and 3,142, but as district rating improved to 4-, 4.5-, and 5-star districts, the mean values increased to between 4,916 and 11,161 for each of those categories. This finding suggested that the highest rated districts also had the largest student populations and was consistent with the findings of Andrews, Duncombe, and Yinger (2002) and others who have found that the relative efficiency of school districts increase with size. Despite this finding, there were some very large districts—enrollment numbers greater than 40,000 students—whose rating were only in the 1.5- to 3.5-star range. See **Table 35**.

After completing a univariate analysis, a multivariate analysis was completed to determine the statistical significance of the results. As with the 2009-2010 results, there were no statistically significant differences found between 1-star through 4-star districts. However, there was a statistically significant difference found between 4.5-star districts ($p < .05$) and the other categories of the FAST and between 5-star districts ($p < .01$).

Table 36:
Distribution of Total Enrollment by FAST Rating, 2009-2010

FAST Rating	Coefficient	Robust Standard Error
1-star	2582.514	1613.67
1.5-star	363.3292	1920.016
2-star	448.7985	1813.072
2.5-star	41.67242	1757.293
3-star	536.21	1745.829
3.5-star	559.5233	1787.458
4-star	233.508	1814.417
4.5-star	4460.861**	1878.917
5-star	8578.378***	2167.578

* p < .10, ** p < .05, *** p < .01

Again, these findings suggested that larger districts are more efficient. See **Table 36**. Finally, an ordered logit was performed to control for other variables which might have an effect on the student population of a district. As in 2008-2009, the percentage of students who were economically disadvantaged were included as a variable, as well as the ethnic make-up of the students within a district. Unlike in the 2008-2009 data, when controlling for both the socioeconomic status of students and their ethnicities, only the total enrollment count of a district, the percentage of students who were Asian/Pacific Islanders, and the socioeconomic status of students were found to be statistically significant. There was a positive, statistically significant relationship ($p < .01$) between the enrollment size of a district and its FAST rating. Also, a positive, statistically significant relationship ($p < .05$) between the percentage of Asian/Pacific Islander students and FAST rating. Conversely, there was statistically significant ($p < .01$) negative relationship between the economic status of students and FAST, again suggesting that the few economically disadvantaged students a district had the higher its

Table 37:
Ordered Logit Model of Total Enrollment and District FAST Rating, 2009-2010

	Coefficient	Standard Error	Robust Standard Error
Total Enrollment	.1088746***	.0384764	.0384904
African American (Percent)	.0588551	.0519823	.0474556
Asian/Pacific Islander (Percent)	.1027445**	.0557112	.0518246
Hispanic (Percent)	.0437704	.0518603	.0473468
White (Percent)	.0409595	.0523135	.0476495
Economically Dis. (Percent)	-.0316231***	.0042201	.0040679

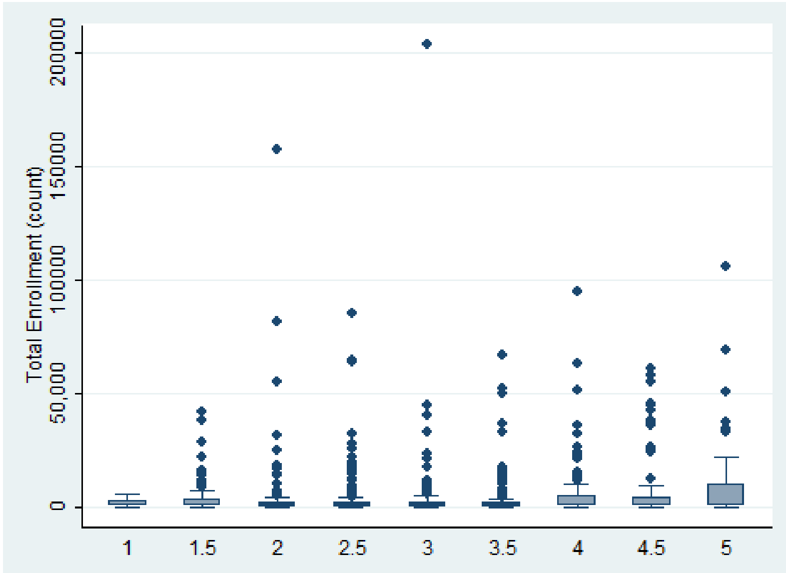
* p < .10, ** p < .05, *** p < .01

rating on the FAST. This finding was consistent with both the findings of 2008-2009 and the research of Ruggiero (1996) which suggested that districts with high numbers of economically disadvantaged are less efficient. The Chi-squared test computed for 2009-2010 resulted in the probability of having a greater Chi-squared test statistic of 0.00, allowing one to reject the hypothesis that Total Enrollment is irrelevant. See **Table 37**.

2010-2011 Data Analyses

For the final year of available FAST data, the same method of analyses was used to determine if the findings for 2010-2011 were consistent with the findings from the previous two years. In 2010-2011, the student population of Texas was 4,912,385 and there were 1,136 school districts and charter schools measured by the FAST. The average size of the school districts and charter schools was 4,296 students, with the smallest district or charter school having an enrollment count of 37 and the largest with an enrollment of 203,294.

Figure 11:
District Size, 2010-2011



Prior to the analyses, a box and whisker chart was prepared to search for outliers. It was determined that both Dallas ISD and Houston ISD—the two largest districts in the state—could be considered outliers and were removed from the data. See **Figure 11**.

After the outliers were removed, the data were divided into the 9 categories of the FAST and the measures of central tendency were calculated. The data showed that 1-star districts had the smallest average enrollment size (1,877 students) and that 5-star was the largest with an average enrollment of 10,380. 5-star districts also had the greatest range of enrollment, with a minimum enrollment of 144 and a maximum enrollment of 105,860. The category with the second highest average enrollment was 4.5-star districts with an average size of 7,173 students. The third highest average enrollment belonged to 4-star districts with approximately 5,125 students on average. The average size of categories 1.5-star to 3.5-star varied, with 3.5-star districts having

Table 38:
District Size by FAST Rating, 2010-2011

FAST Rating	# Obs	Mean	Standard Deviation	Min.	Max
All	1,136	4,296	12595.57	37	203,294
1-star	35	1,877	1729.085	37	5,839
1.5-star	95	3,971	7562.995	66	41,708
2-star	135	3,151	9291.41	51	81,511
2.5-star	190	3,449	10012.38	40	85,273
3-star	228	2,436	5300.204	57	44,468
3.5-star	166	3,248	8699.921	75	66,364
4-star	143	5,125	11767.9	91	94,632
4.5-star	97	7,173	14333.33	141	60,573
5-star	45	10,380	20738.2	144	105,860

the next highest average while 3-star districts had the second lowest overall average. See **Table 38**.

Once the measures of central tendency were calculated, a logistic regression was completed to determine the statistical significance of the differences in the categories. There was no statistical significance in categories 1- to 3.5-star districts. However, there

Table 39:
Distribution of Total Enrollment by FAST Rating, 2010-2011

FAST Rating	Coefficient	Robust Standard Error
1-star	1877	1695.331
1.5-star	2093.747	1983.19
2-star	1273.511	1902.444
2.5-star	1571.626	1844.883
3-star	586.1128	1820.811
3.5-star	1370.777	1865.513
4-star	3247.51*	1891.457
4.5-star	5295.876***	1977.678
5-star	8503.444***	2260.441

* $p < .10$, ** $p < .05$, *** $p < .01$

was a positive, statistically significant difference in 4-star ($p < .10$), 4.5-star ($p < .01$) and 5-star ($p < .01$) districts. Again, the positive correlation in 4.5- and 5-star districts suggests that larger districts are more efficient that smaller districts, which was consistent with the findings in both the 2008-2009 and 2009-2010 FAST analyses and the research of Andrews, Duncombe, and Yinger (2002). See **Table 39**.

The final step in the process was to complete an ordered logit to determine if other factors within total enrollment were correlated to FAST rankings. As with 2008-09 and 2009-10, student ethnicity and the percent of economically disadvantaged students were included in the regressions. Findings in 2010-11 were consistent with the two previous years which showed a positive, statistically significant relationship existed between total enrollment count ($p < .05$), the percent of African American students ($p < .05$), and the percent of Asian/Pacific Islander students ($p < .01$). However, 2010-11 data showed no significant relationship existed between the percent of Hispanic students and FAST efficiency, while there was a positive relationship between the percent of White students enrolled ($p < .10$). Once again, a negative, statistically significant relationship

Table 40:
Ordered Logit Model of Total Enrollment and District FAST Rating, 2009-2010

	Coefficient	Standard Error	Robust Standard Error
Total Enrollment	.0954052**	.039065	.0395822
African American (Percent)	.0760989**	.0315471	.035893
Asian/Pacific Islander (Percent)	.1347296***	.0371512	.0439995
Hispanic (Percent)	.053497	.0305209	.0337512
White (Percent)	.0577043*	.0313901	.0345787
Economically Dis. (Percent)	-.0287134***	.0039902	.0040716

* p < .10, ** p < .05, *** p < .01

was seen with the percent of students who were economically disadvantaged and the overall efficiency of the district. The Chi-squared test shows that the probability of having a greater Chi-squared test statistic is 0.00. See **Table 40.**

Multiyear FAST Data Analyses

Once the single year analyses were completed, the data were pooled to determine the overall impact of enrollment over the three year span of the FAST. As with the spending by function and the spending by program, a dummy variable of the school year was included to restrict the coefficients to ensure that the same coefficients were being compared each year. As with prior analyses, data from 2008-2009 were omitted to account for collinearity.

The ordered logistic regression confirmed the findings of the individual years that the total enrollment of a district or charter school had a positive, statistically significant relationship ($p < .01$) with FAST rating for the pooled data. The percent of African American students and the percent of Asian/Pacific Islander students was also found to have a positive correlation with FAST rating at the $p < .01$ level, while the

Table 41:
Ordered Logit Model of Total Enrollment, 2008-2011

	Coefficient	Standard Error	Robust Standard Error
Total Enrollment	.1240945***	.0223686	.0226976
African American (Percent)	.0566216***	.022323	.020756
Asian/Pacific Islander (Percent)	.1054953***	.0250253	.0245696
Hispanic (Percent)	.0397416*	.0220642	.0204689
White (Percent)	.0389617*	.0223969	.0207132
Economically Dis. (Percent)	-.029198***	.0223882	.0023831
School Year 2	.0793374	.0741924	.0742607
School Year 3	.1884174**	.084809	.0838526

* $p < .10$, ** $p < .05$, *** $p < .01$

percent of Hispanic students and the percent of White students was positively related to FAST at the $p < .10$ level. These findings implied that, regardless of race, the overall enrollment of a district or charter school was the most important demographic factor in the overall FAST rating for that district or charter school. Also, the percent of students who were economically disadvantaged continued to display a negative correlation with FAST rating. See **Table 41**.

It is important to note methodological change in the FAST between to the 2010 FAST report and the 2011 and 2012 FAST reports which had an effect on the findings of this section. According to the FAST Appendix, the original analysis divided districts into two groups—metropolitan and nonmetropolitan districts—and then divided the districts into spending quintiles (i.e. very low, low, average, high, very high). The two most recent versions of the FAST report divided districts into four groups—small metropolitan, small non-metropolitan, midsized and large districts—before subdividing each group of districts by spending. The change in strategy was intended to reduce the disparity with respect to district size.

The result of this methodological change was that district size had less of an effect on overall efficiency in the 2011 and 2012 FAST report than it had in 2010. This can be seen by noting the coefficient value in 2010 was .1716884 while the coefficient value in 2012 was .0954052, meaning that district size in 2010 had almost double the effect on efficiency as it did in 2012. In order to control for the change in methodology, a fourth ordered logistic regression was completed on the data to determine if the interaction was different in 2010 compared to the other FAST years. The ordered logit

Table 42:
Ordered Logit Model of Total Enrollment, 2008-2011

	Coefficient	Standard Error	Robust Standard Error
Total Enrollment	.0959608***	.0263137	.026571
African American (Percent)	.05596***	.0222965	.0206552
Asian/Pacific Islander (Percent)	.1051645***	.0250178	.0245439
Hispanic (Percent)	.0391177*	.0220381	.0203691
White (Percent)	.0382336*	.0223715	.020616
Economically Dis. (Percent)	-.0295253***	.0023868	.0023824
School Year 2	.05295823*	.3016025	.2972212
School Year 3	.638266**	.3042387	.2988423
School Year 2008	.0649842	.0422271	.0418081

* p < .10, ** p < .05, *** p < .01

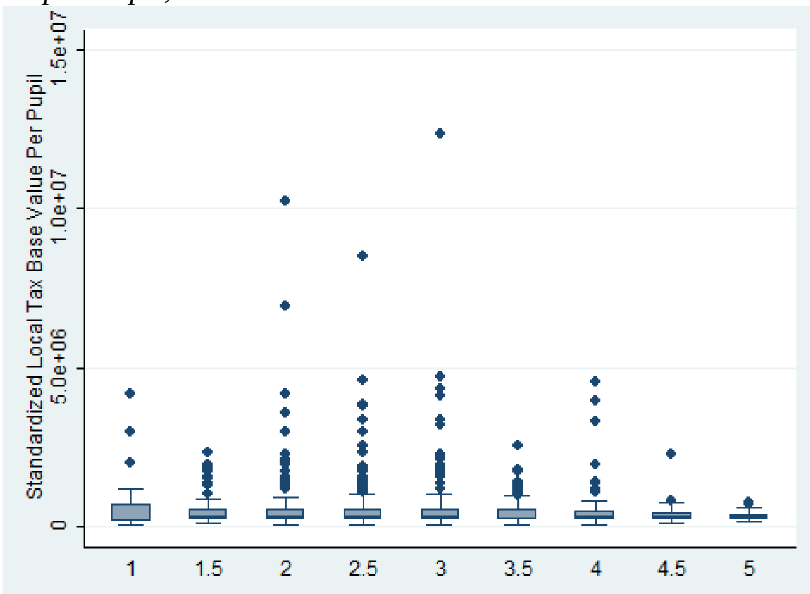
revealed that despite the methodological change, the relationship between district size and rating was not substantially different. Therefore, the change in methodology did not produce a statistically significant difference on the findings. As with each of the previous Chi-squared tests relating to enrollment, the Chi-squared test found that the probability of having a greater Chi-squared test statistic is 0.00. Therefore, the hypothesis is rejected that enrollment and demographic make-up of districts is irrelevant to efficiency. See **Table 42**.

Property Wealth per Pupil as a Predictor of Efficiency

2008-2009 Data Analyses

Using quantitative analyses, the data from the 2008-09 FAST were analyzed to determine what, if any, relationship existed between a school district's efficiency as measured by the FAST and property value per pupil. In 2008-09, the data showed 1,131 districts and charter schools rated by the FAST. Of those, 111 observations had a property value of $0, meaning they were likely charter schools which do not levy a

Figure 12:
Property Value per Pupil, 2008-2009



property tax and therefore have no property value per pupil. The remaining 1,020 observations were analyzed using univariate and multivariate methods.

The data were sorted into each of the 9 categories used by the FAST—1-star, 1.5-star, 2-star, etc.—to calculate the measures of central tendency for each category. Prior to calculating the measures of central tendency, a box and whisker plot was performed to determine if any outliers existed within the data. The data showed any observations above $4,692,847 per pupil were considered outliers because those observations were more than 5 standard deviations above the mean; therefore, any observations that were above that threshold were removed from the data. There were a total of 11 outliers removed. See **Figure 12**.

Table 43:
Property Value per Pupil, 2008-2009

FAST Rating	# Obs	Mean	Standard Deviation	Min.	Max
All	1,020	$530,153	832538.8	$30,920	$10,950,949
1-star	23	$673,039	754800.2	$39,273	$3,214,192
1.5-star	79	$389,103	303461.5	$54,901	$1,633,202
2-star	130	$630,831	722198.8	$58,874	$4,585,111
2.5-star	184	$428,649	493891.1	$61,221	$3,052,426
3-star	198	$532,469	659531.6	$30,920	$4,456,982
3.5-star	172	$405,968	421877.8	$35,016	$2,950,051
4-star	115	$463,029	564989	$71,102	$4,271,507
4.5-star	76	$337,773	180027	$80,836	$866,277
5-star	32	$318,663	134643.5	$116,821	$800,306

The data showed that there was no consistent pattern in either the mean value, minimum value, or maximum value when comparing FAST districts rated from 1-star to 4-star. However, the data revealed that 4.5- and 5-star districts did, in fact, have a lower mean property value per pupil than did 1-star to 4-star districts. The 4.5- and 5-star districts had a maximum value per pupil of$866,277 and $800,041 respectively, while each of the other FAST categories had a maximum value of greater than $1.6 million per pupil. More interestingly, despite the fact that 5-star districts had the lowest maximum property value per pupil, 5-stardistricts also displayed the highest minimum value per pupil. The minimum property value per pupil for 5-star districts was $116,821, which was more than the highest minimum value per pupil of any other category. See **Table 43**.

Once the measures of central tendency were calculated, a regression analysis was performed to test for the differences in means using robust standard errors. The analyses indicated a statistically significant difference existed between, 7 of the FAST categories

Table 44:
Distribution of Property Wealth per Pupil by FAST Rating, 2008-2009

FAST Rating	Coefficient	Robust Standard Error
1-star	673039.1***	111734.8
1.5-star	-283936.4**	126962.4
2-star	-42207.99	121216.8
2.5-star	-244930.4**	118512.7
3-star	-267070.9	118046.1
3.5-star	-267070.9**	118971.2
4-star	-210010.4*	122399.4
4.5-star	-335262.9***	127526.2
5-star	-354375.9**	146485.6

* p < .10, ** p < .05, *** p < .01

of the FAST and 1-star districts; however, only the 4.5-star districts and charter schools reached the p < .01 threshold. See **Table 44**.

The next step in the process involved completing an ordered logit using district FAST rating as the dependent variable and the property value per pupil as the independent variable. During the analyses, several external factors which related were controlled for, including the percent of revenue generated locally and the percent of state revenue earned by the district. These controls were based on the idea that districts with higher percentages of locally generated revenue might be more inclined to be efficient in their spending. Also, the district's adopted maintenance and operations tax rate and interest and sinking tax rate were controlled for with the belief that districts which have a higher tax rate would be more desirous to be more efficient with their money. Finally, the district or charter schools overall size and the percent of students who were economically disadvantaged were also included as part of the regression.

Table 45:
Ordered Logit Model of Property Value per Pupil, 2008-2009

	Coefficient	Standard Error	Robust Standard Error
Property Value Per Pupil	-1.099267***	.1812158	.1938392
Local Revenue Percent	.0398169***	.008629	.0090855
Federal Revenue Percent	-.0621884**	.0303807	.0296783
M&O Tax Rate	-.7873866	.9706824	.9229177
I&S Tax Rate	.2273707	.5189514	.5101112
Total Enrollment	.0967653*	.0498514	.0534448
Economically Dis. (Percent)	-.0302154***	.0036771	.003777

* p < .10, ** p < .05, *** p < .01

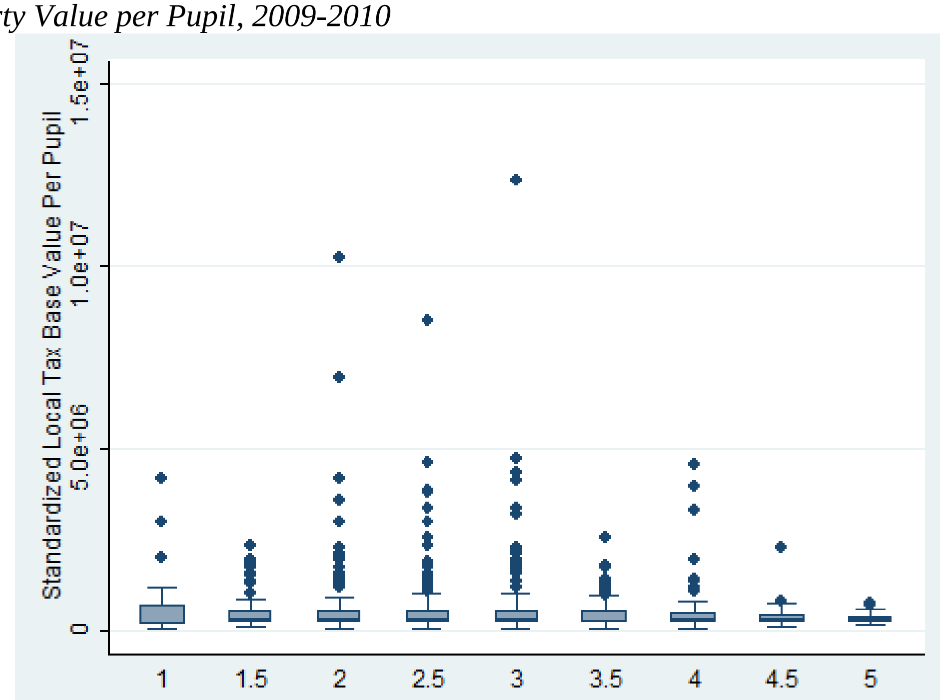
The ordered logit showed a statistically significant, negative relationship ($p < .01$) between tax value per pupil and FAST rating, meaning that as tax value went up the FAST rating of the district went down. When controlling for percent of funds from local revenue and percent of funds from federal revenue, both exhibited a statistically significant relationship ($p < .01$ and $p < .05$), although in opposite directions. The percent of local revenue showed a positive relationship with property value per pupil while the percent of federal revenue showed a negative relationship. Those findings can be interpreted as indicating that districts with a greater portion of federal revenue are using those funds to fund programs which are not efficient. When controlling for tax rates, neither the maintenance and operations nor the interest and sinking rate for districts were statistically significant, while the total enrollment of a district or charter school continued to display a positive relationship with the FAST rating and the percent of students who were economically disadvantaged continued to display a negative relationship with efficiency. The Chi-squares test indicated that the probability of having a greater Chi-square statistic is 0.00. See **Table 45**.

2009-2010 Data Analyses

Using the same methodology, the data from the 2009-10 FAST were analyzed to determine what, if any, relationship existed between a school district's efficiency as measured by the FAST and property value per pupil. In 2009-2010, the data showed 1,138 districts and charter schools rated by the FAST. Of those, 118 observations had a property value of $0. The remaining 1,020 observations were analyzed using univariate and multivariate methods.

The data were sorted into each of the 9 categories used by the FAST—1-star, 1.5-star, 2-star, etc.—to determine what the measures of central tendency were for each of the categories. Prior to calculating the measures of central tendency, a box and whisker plot was performed to determine if any outliers existed within the data. The data

Figure 13:
Property Value per Pupil, 2009-2010



showed any observations above $5,000,000 per pupil were considered outliers; therefore, any observations that were above that threshold were removed from the data. There were a total of 4 outliers removed. See **Figure 13**.

The data showed that there was no consistent pattern in either the mean value, minimum value, or maximum value when comparing FAST districts rated from 1-star to4-star. However, the data revealed that 4.5- and 5-star districts did, in fact, have a lower mean property value per pupil than did 1-star to 4-star districts. The 5-star districts had a maximum value per pupil of $752,041, while each of the other FAST categories had a maximum value of greater than $2,000,000 per pupil. As with the 2008-2009 data, 5-star districts showed to have lowest maximum property value per pupil while at the same time they displayed the highest minimum value per pupil. The minimum property value per pupil for 5-star districts was $153,323, which was more than double the highest minimum value per pupil of any other category. See **Table 46**.

Table 46:
Property Value per Pupil, 2009-2010

FAST Rating	# Obs	Mean	Standard Deviation	Min.	Max
All	1,020	$521,372	826470.1	$30,811	$12,367,087
1-star	36	$580,787	845698.2	$46,422	$4,136,768
1.5-star	85	$471,034	444342.5	$74,925	$2,342,043
2-star	130	$533,762	641143.6	$64,153	$4,154,755
2.5-star	185	$527,627	663945.2	$62,245	$4,618,667
3-star	195	$549,441	722483.5	$54,000	$4,725,016
3.5-star	146	$428,781	369946.9	$30,811	$2,535,408
4-star	118	$458,938	635541.7	$39,370	$4,557,816
4.5-star	86	$352,879	269101.2	$73,713	$2,264,785
5-star	35	$330,931	139241.2	$153,323	$752,041

Table 47:
Distribution of Property Wealth per Pupil by FAST Rating, 2009-2010

FAST Rating	Coefficient	Robust Standard Error
1-star	580787.3***	98389.58
1.5-star	-109753.5	117390.3
2-star	-47025.52	111181.2
2.5-star	-531160.57	107537.4
3-star	-31346.62	107087.3
3.5-star	-152006.2	109852.1
4-star	-121849.2	112400.6
4.5-star	-227908.5*	117187.1
5-star	-249856.6*	140134.2

* $p < .10$, ** $p < .05$, *** $p < .01$

Once the measures of central tendency were calculated, a regression analysis was performed to test for the differences in means, using robust standard errors. Again, the analyses indicated no statistical significant relationship between the coefficient values of the different FAST categories except in relationship between 1-star districts and 4.5- and 5-star districts ($p < .10$). The property value per pupil for both 4.5 and 5-star districts were statistically significantly less than 1-star districts, although only at the .10 level of significance. See **Table 47**.

Similar to 2008-2009 data, the next step in the process involved completing an ordered logit using district FAST rating as the dependent variable and the property value per pupil as the independent variable. During the analyses, several external factors which related were controlled for, including the percent of revenue generated locally and the percent of state revenue earned by the district. Like the 2008-09 data, the district's adopted maintenance and operations tax rate and interest and sinking tax rate were

Table 48:
Ordered Logit Model of Property Value per Pupil and District FAST Rating, 2009-2010

	Coefficient	Standard Error	Robust Standard Error
Property Value Per Pupil	-.8270128***	.1537557	.1391949
Local Revenue Percent	.0118193**	.0062814	.0054425
Federal Revenue Percent	-.1183148***	.0164251	.0159389
M&O Tax Rate	-.7397287	.9130895	.8921238
I&S Tax Rate	.70013	.505978	.5041454
Total Enrollment	.1180055**	.0467005	.0468238
Economically Dis. (Percent)	-.0271948***	.0041807	.0040311

* $p < .10$, ** $p < .05$, *** $p < .01$

included as variables with the belief that districts that have a higher tax rate would be more desirous to be more efficient with their money. Finally, the district's enrollment and percent of students who were economically disadvantaged were included in the regression.

The findings for property value per pupil continued to indicate a statistically significant, negative relationship with FAST rating ($p < .01$). The relationship between percent of revenue generated locally continued to be positive, though its statistical significance went from the .01 level to the .05 level. Federal revenue as a percent of overall revenue continued to exhibit a statistically significant, negative relationship ($p < .01$). As with 2008-09, the relationship between the maintenance and operations tax rate and the interest and sinking tax rate and FAST rating were not statistically significant. This result indicated that the overall level of taxation for a district had no effect on a district's FAST rating. Finally, while the total enrollment of a district did indicate a positive, statistically significant rating ($p < .05$), the percentage of students who were economically disadvantaged did not have a statistically significant impact on FAST rating ($p < .01$). Like the 2008-09 data, the Chi-squared test showed that the probability of having a greater Chi-squared test statistic was 0.00. See **Table 48**.

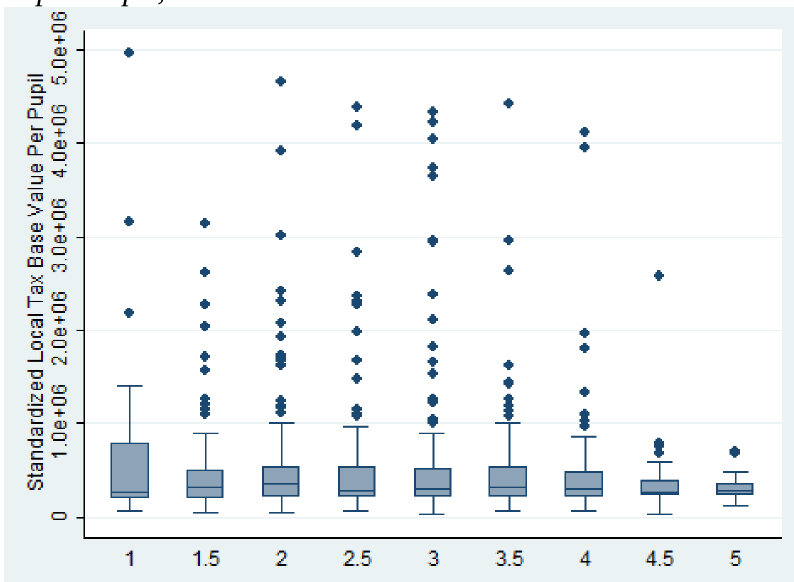
2010-2011 Data Analyses

Data from the 2010-2011 FAST report were analyzed to establish whether or not the findings in 2008-09 and 2009-10 were consistent with the 2010-11 data. In 2010-11, there were 1,136 districts and charter schools which were measured by the FAST. Of those, 120 observations had a property value per pupil of $0 and were removed from the data set. Of the remaining 1,016 districts, the average property value per pupil was $488,132 per student with a minimum value per student of $31,010 and a maximum value of $4,963,364.

Prior to calculating the measures of central tendency, a box and whisker chart was created to help determine outliers. It was determined that districts with a property value of greater than $3,506,655 per student were more than 5 standard deviations from the mean and would be considered outliers which were removed from the data. A total of 13 outliers were removed. The remaining 1,003 districts were used in the data set. See **Figure 14**.

The data indicate that overall the property value per pupil was down in 2010-2011 compared to both 2008-09 and 2009-10. Similar to the two prior years of FAST

Figure 14:
Property Value per Pupil, 2010-2011



data, 4.5- and 5-star districts had the lowest average property value per pupil with values of $341,303 and $310,410 respectively, while the average property values per pupil were mixed among the other categories. Once again, 5-star districts had the highest minimum value per pupil and the smallest maximum value per pupil. See **Table 49**.

Table 49:
Property Value per Pupil, 2010-2011

FAST Rating	# Obs	Mean	Standard Deviation	Min.	Max
All	1,016	$488,132	603704.5	$31,010	$4,963,364
1-star	32	$561,345	664523.2	$77,227	$3,165,677
1.5-star	92	$490,498	539186.3	$54,459	$3,136,606
2-star	126	$498,549	512066.7	$45,916	$3,015,653
2.5-star	175	$457,829	441367.4	$71,623	$2,833,147
3-star	200	$429,377	424255.9	$31,010	$2,953,849
3.5-star	147	$443,211	402339.7	$74,247	$2,964,514
4-star	119	$395,069	300414.5	$74,612	$1,969,355
4.5-star	80	$341,303	290752.9	$39,051	$2,572,977
5-star	32	$310,410	132740.1	$120,365	$701,014

Table 50:
Distribution of Property Wealth per Pupil by FAST Rating, 2010-2011

FAST Rating	Coefficient	Standard Error
1-star	561345.2***	76087.1
1.5-star	-70397.1	88334.02
2-star	-62795.81	85202.89
2.5-star	-103516.5	82751.75
3-star	-131968.7	81948.32
3.5-star	-118134.3	83961.25
4-star	-166276.3*	85708.93
4.5-star	-220042.7**	90027.48
5-star	-250935.6**	107603.4

* p < .10, ** p < .05, *** p < .01

Once the measures of central tendency were calculated, a regression analyses was conducted to determine the significance of the relationship between the property value per pupil and FAST rating. Unlike the prior two years of data which showed only a slightly (p < .10) statistically significant relationship between 4.5- and 5-star districts and the FAST rating, 2010-11 data indicated that there was a negative, statistically significant (p < .10) correlation between both 4--star districts and FAST rating. None of the other categories indicated a statistically significant relationship. See **Table 50**.

After the regression analyses were run, an ordered logistic regression was completed. As with each of the two previous years, there was a negative, statistically significant (p < .01) correlation between both property value per pupil, percent of Federal revenue, and the percentage of low-SES students. Again, as with prior years, there was a positive, statistically significant relationship between the percent of local revenue and FAST rating. The Chi-squared test confirmed that the probability of having a greater Chi-squared test statistic was 0.00. See **Table 51**.

Table 51:
Ordered Logit Model of Property Value per Pupil and District FAST Rating, 2010-2011

	Coefficient	Standard Error	Robust Standard Error
Property Value Per Pupil	-1.338012***	.219229	.2490431
Local Revenue Percent	.0273193***	.0078318	.0077253
Federal Revenue Percent	-.0857239***	.0159126	.0201185
M&O Tax Rate	-1.339418	1.210002	1.199149
I&S Tax Rate	-.0094341	.1042247	.1079767
Total Enrollment	.1186005**	.0521768	.0525231
Economically Dis. (Percent)	-.0346564***	.0046689	.0053114

* p < .10, **p < .05, ***p < 01

Multiyear FAST Data Analyses

Once the three individual year analyses of FAST data were completed, the data were pooled into one large data set to determine if the patterns found existed throughout all three years of FAST data. Data from 2008-09 were omitted in the dummy variable calculations to account for collinearity. Findings from the multiyear ordered logistic regression indicated that property value was a negative, statistically significant predictor of FAST rating, which was consistent from all three years of analysis. Also consistent with the individual year analyses was the finding that the percent of Federal revenue was negatively correlated with FAST efficiency. As had been established with each of the prior variables, the percent of students who were economically disadvantaged continued to show a statistically significant, negative relationship with FAST efficiency, while the size of a district or charter school remained positively correlated with efficiency. The one difference in the findings in the multiyear analysis from the individual analyses was

Table 52:
Ordered Logit Model of Property Value per Pupil and District FAST Rating, 2008-2011

	Coefficient	Standard Error	Robust Standard Error
Property Value Per Pupil	-.2500752***	.0675753	.1542003
Local Revenue Percent	.0316224	.1039744	.1992105
Federal Revenue Percent	-.2012587***	.0424507	.0431991
M&O Tax Rate	.7181087	.5314965	.6032671
I&S Tax Rate	.1213039***	.0344087	.0357982
Total Enrollment	.2620694***	.0285066	.0368442
Economically Dis. (Percent)	-.0369118***	.0022315	.0022823
School Year 2	-2.262351***	.5042639	.5099107
School Year 3	-2.237429***	.4977237	.5033551

* p < .10, **p < .05, ***p < .01

that the Interest and Sinking tax rate—the tax rate which was levied by school districts to pay for school construction bonds—was statistically significant. The positive coefficient suggested that as districts' Interest and Sinking tax rate increase, their efficiency increased as well. The finding that school construction expenditures was positively associated with efficiency supported research of Schneider (2002) who found that clean air, good light, and a quiet, comfortable, and safe learning environment are conducive to student achievement. As in the previous years, the Chi-squared tests showed that the probability of having a greater Chi-Squared test was 0.00. These results confirmed the fact that one can reject the hypothesis that Property Values per Pupil are irrelevant to FAST efficiency. See **Table 52**.

Administrative Costs per Pupil as a Predictor for Efficiency

2008-2009 Data Analyses

Following the same statistical procedures used to this point, a quantitative analyses of the relationship between administrative costs per pupil—defined as the spending in the Administration function by districts—and the FAST rating was accomplished. In 2008-2009, there were 1,131 districts and charter schools which were rated by the FAST. Those districts and charter schools spent an average of $1,152 per pupil on administrative costs, with a minimum of $452 per pupil and a maximum of $9,496 per pupil.

As with the variables which were chosen to include in this study, the data were sorted into each of the 9 categories of the FAST to calculate the measures of central

Figure 15:
Total Administrative Cost per Pupil, 2008-2009

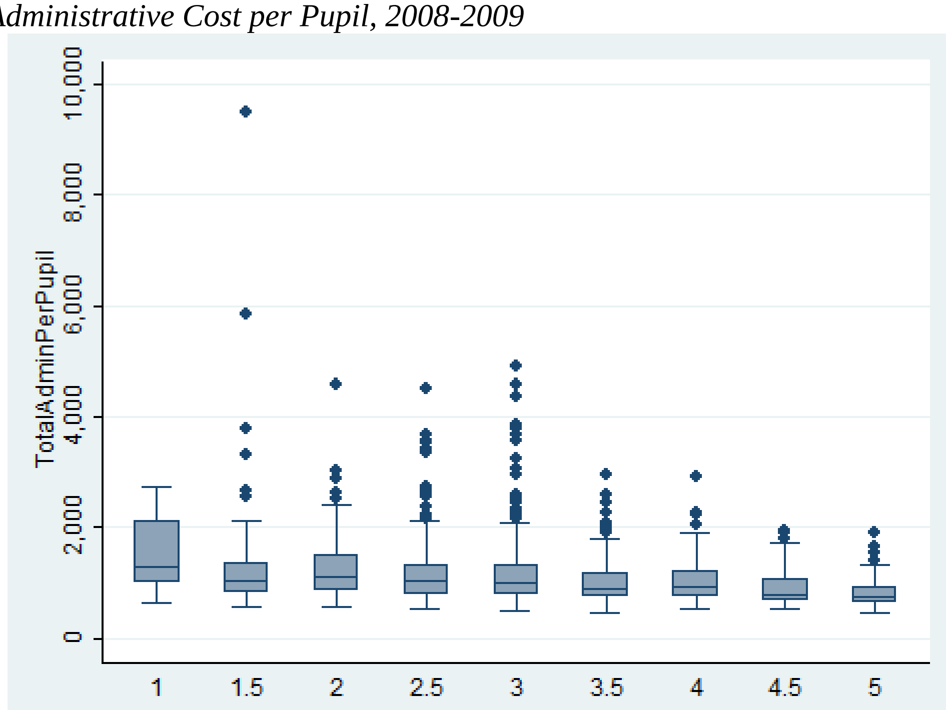


Table 53:
Administrative Costs per Pupil, 2008-2009

FAST Rating	# Obs	Mean	Standard Deviation	Min.	Max
All	1,131	$1,152	638.8009	$452	$9,496
1-star	24	$1,444	634.3747	$645	$2,752
1.5-star	81	$1,171	566.2501	$576	$3,798
2-star	144	$1,251	519.8527	$563	$3,018
2.5-star	200	$1,189	579.2666	$545	$3,668
3-star	222	$1,188	602.3246	$516	$3,842
3.5-star	186	$1,034	428.6452	$463	$2,952
4-star	138	$1,056	435.3091	$535	$2,926
4.5-star	86	$917	321.6198	$548	$1,932
5-star	46	$851	325.9724	$452	$1,923

tendency in each of the categories. Prior to determining the central tendencies, a box-and-whisker plot was completed to assess whether any outliers existed within the data. It was estimated that administrative costs exceeding $4,346 per pupil could be considered outliers because they were greater than 5 standard deviations above the mean. Therefore, those observations were removed from the analyses. In total, there were 7 districts and charter schools removed for being outliers. See **Figure 15**.

Of the remaining 1,124 districts and charter schools, 1-star districts and charter schools did spend more on administrative costs per pupil ($1,444) than did all other categories while 4.5- and 5-star district did spend the least ($917 and $851 respectively). However, the average administrative cost per pupil varied between the other ratings in the FAST, with 3-star districts spending more than 1.5-star districts and 4-star districts spending more than 3-star districts. See **Table 53**.

Table 54:
Distribution of Administrative Costs per Pupil by FAST Rating, 2008-2009

FAST Rating	Coefficient	Robust Standard Error
1-star	1444.4580***	104.7653
1.5-star	-273.0262**	119.2805
2-star	-193*	113.1595
2.5-star	-255.2283**	110.8732
3-star	-256.6385**	110.283
3.5-star	-410.8777***	111.3193
4-star	-388.1033***	113.5103
4.5-star	-527.2607***	118.4853
5-star	-593.7607***	130.7738

* $p < .10$, ** $p < .05$, *** $p < .01$

A regression analysis was completed to test for the differences in the central tendencies to determine if there was a statistical significance in the differences. The regression did show that there was a statistically significant difference between all 9 categories of the FAST, with 8 of the 9 categories showing a significant at the $p < .05$ or $p < .01$ level. These findings suggested that more efficient districts do spend less on administrative costs than do less efficient districts or charter school. See **Table 54**.

The next step in the process was to conduct an ordered logit regression to control for student enrollment count, percent of economically disadvantaged students, the average salaries of both campus level and district-level administrators, and the percent of campus and district-level administrators of the total staff. The choice to include administrative salaries was made to substantiate both the research (Walters, 2005) and the commonly held belief that high administrative costs had a negative effect on the efficiency of school. The analysis indicated a positive, statistically significant relationship did exist between the average salary of campus administrators and the FAST

Table 55:
Ordered Logit Model of Administrative Costs per Pupil and District FAST Rating, 2008-2009

	Coefficient	Standard Error	Robust Standard Error
Total Admin. Costs per Pupil	-.7245652***	.2155092	.2148632
Avg. Salary of Campus Admin.	.0727489***	.0312356	.0257447
Average Salary of Central Admin.	-.0852705***	.0321179	.028173
Total Campus Admin. (Percent)	.0160712*	.0148974	.0093883
Total Central Admin. (Percent)	.1206865**	.0457172	.0466372
Total Enrollment Count	.1408735**	.0564518	.0578696
Percent Economically Dis.	-.0225477***	.0028379	.0031669

* p < .10, ** p < .05, *** p < .01

rating ($p < .01$), but a negative relationship ($p < .01$) between the salary of central office administrators and efficiency. The ordered logit regression also indicated that a positive, statistically relationship existed between the percent of campus administrators ($p < .10$)and the percent of central office administrators ($p < .05$) in the district. The Chi-squared test conducted to test the whether the multiple coefficients are the same resulted in the probability of having a greater Chi-square test statistics was 0.00; therefore allowing one to reject the hypothesis that Administrative Costs per Pupil are irrelevant. The positive relationship suggested that as the percentage of administrators increased the FAST rating of the district or charter school also increased. However, the total administrative costs per pupil exhibited a negative, statistically significant relationship with FAST rating, which supports the claim of Walters (2006) that low administrative costs can be found in higher performing districts. See **Table 55**.

2009-2010 Data Analyses

Following the completion of the 2008-2009 FAST data analyses of administrative costs per pupil, the data from the 2009-2010 school year were analyzed. In 2009-2010, there were 1,138 school districts and charter schools that were rated by the FAST. However, after completing a box and whisker plot of all districts, it was determined that districts which spent over $4,648 per pupil could be considered outliers because those districts or charter schools spent more than 5 standard deviations above the mean. A total of 5 observations were removed as outliers. See **Figure 16.**

The data were divided into each of the 9 categories of the FAST for analyses to determine the measures of central tendency for each category. Of each of the categories,

Figure 16:
Total Administrative Cost per Pupil, 2009-2010

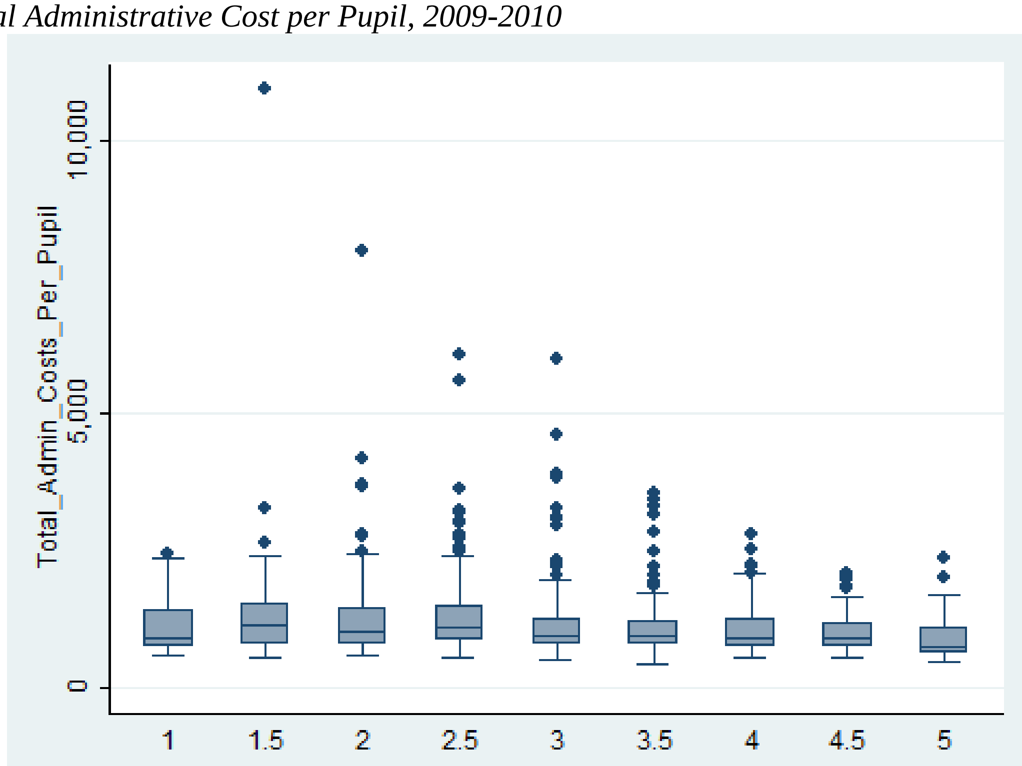


Table 56:
Distribution of Administrative Costs per Pupil by FAST Rating, 2009-2010

FAST Rating	# Obs	Mean	Standard Deviation	Min.	Max
All	1,138	$1,168	696.0402	$443	$10,932
1-star	37	$1,145	543.1118	$581	$2,450
1.5-star	88	$1,238	561.8275	$530	$3,263
2-star	141	$1,219	632.078	$574	$4,188
2.5-star	197	$1,276	575.1058	$534	$3,614
3-star	217	$1,137	602.8656	$504	$4,608
3.5-star	163	$1,098	525.6473	$443	$3,537
4-star	140	$1,044	436.397	$547	$2,810
4.5-star	104	$1,002	362.0186	$558	$2,100
5-star	46	$915	415.4912	$467	$2,364

2.5-star districts had the highest mean spending per pupil ($1,276) and the 5-star districts had the lowest mean spending per pupil ($915). 1-star districts had the highest minimum value per pupil ($581), while 3-star districts and charter schools had the highest maximum value per pupil ($4,608). 4.5-star district had the lowest value per pupil with a value of $2,100 per pupil. See **Table 56**.

A regression analyses was conducted to determine if there was a statistically significant difference between the categories of the FAST. Unlike data from 2008-2009, the regression analysis showed only one statistically significant relationship—5-star at the $p < .10$ level—existed between any of the categories. The lack of a statistically significant relationship indicated that, though higher rated districts and charter schools may have a lower average administrative cost per pupil, the differences in FAST ratings were caused by something other than administrative cost. This finding is contradictory to

Table 57:
Distribution of Administrative Costs per Pupil by FAST Rating, 2009-2010

FAST Rating	Coefficient	Standard Error
1-star	1144.622***	89.05757
1.5-star	93.62838	106.1413
2-star	73.91029	100.0625
2.5-star	131.2362	97.0612
3-star	-7.1884422	96.35136
3.5-star	-46.88543	98.64885
4-star	-99.87876	100.1367
4.5-star	-142.1312	103.6964
5-star	-229.2086*	119.6275

* p < .10, ** p < .05, *** p < .01

widely held belief that schools are inefficient due to high administrative costs. The relative efficiency of school districts and charter schools measured by FAST ratings—at least in 2009-2010—cannot be attributed to administrative costs. See **Table 57**.

Once the regression analyses was calculated, an ordered logit regression was prepared to control for other factors which may have an impact on the administrative spending of a school district or charter school. As with all the ordered logit regressions completed for this study, the total enrollment count and the percent of students who were economically disadvantaged were variables which were controlled for during the analyses. In addition, administrative cost factors including the average salary of campus and central office administrators were included, as well as the percent of employees who were campus administrators and central office administrators.

It was found that a statistically significant relationship did exist between 5 of the 7 independent variables and the FAST rating. Of interest, however, was the relationship

Table 58:
Ordered Logit Model of Administrative Costs per Pupil and District FAST Rating, 2009-2010

	Coefficient	Standard Error	Robust Standard Error
Total Admin. Costs per Pupil	-.4350179**	.20178717	.194255
Avg. Salary of Campus Admin.	.0206493	.0299836	.0313382
Average Salary of Central Admin.	-.060154**	.0311836	.029614
Total Campus Admin. (Percent)	.0287034	.0215304	.0392659
Total Central Admin. (Percent)	.0936074*	.0490896	.0505357
Total Enrollment Count	.141748***	.0537711	.0535547
Percent Eco. Disadvantaged	-.0267264***	.002893	.0030961

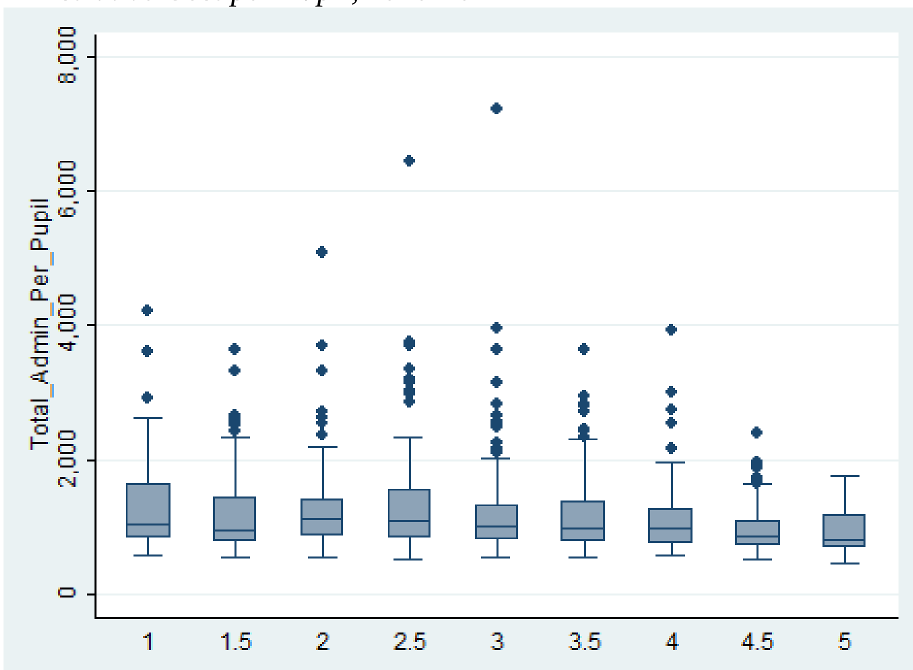
$* p < .10$, $** p < .05$, $*** p < .01$

between the coefficients of the variables and the FAST rating. A negative coefficient indicated an inverse relationship between the variable and the FAST rating while a positive coefficient indicated a direct relationship between the variable and the FAST rating. When studying the ordered logit regression, it was expected to see the negative coefficient between total administrative costs per pupil and the percent of economically disadvantaged students and the FAST rating. What was surprising to observe was that a positive coefficient existed between the percent of central office administrators and the FAST. This relationship indicated that as the percent of central office administrators increased, the FAST rating increased. The Chi-squared test performed indicated that the probability of having a greater Chi-squared test statistic was 0.00. See **Table 58**.

2010-2011 Data Analyses

After the analyses of the 2009-2010 FAST data were completed, the final year of FAST data were analyzed using the same methodology as the previous two years. 2010-2011 FAST data showed that there were 1,136 school districts and charter schools with

Figure 17:
Total Administrative Cost per Pupil, 2010-2011



administrative expenditures. Prior to analyses, a box and whisker plot was created to determine if there were any outliers within the data. It was calculated that administrative expenditures of greater than $4,210 per student were more than 5 standard deviations from the mean and would be removed from the data as outliers. A total of 4 outliers were removed. See **Figure 17**.

As with the prior years, the districts and charter schools were divided into the 9 categories of the FAST and the measures of central tendency were calculated. The data showed that 1-star districts spend more on average ($1,322) than any of the other categories of the FAST, while 4.5- and 5-star districts spend the least ($963 and $924, respectively. In fact, 1-star districts spend an average of $380 more per pupil than do 5-

Table 59:
Distribution of Administrative Costs per Pupil by FAST Rating, 2010-2011

FAST Rating	# Obs	Mean	Standard Deviation	Min.	Max
All	1,136	$1,171	607.8321	$466	$7,210
1-star	34	$1,322	733.0756	$578	$3,614
1.5-star	95	$1,214	616.5237	$551	$3,644
2-star	135	$1,249	557.6454	$552	$3,688
2.5-star	189	$1,249	593.0258	$503	$3,739
3-star	228	$1,140	501.7611	$541	$3,969
3.5-star	166	$1,160	537.3183	$532	$3,630
4-star	143	$1,080	497.4604	$560	$3,928
4.5-star	97	$963	361.6076	$517	$2,402
5-star	45	$942	362.3805	$466	$1,771

star districts. Overall, average spending per pupil decreased as the FAST rating increased, though 1.5-star districts spent less ($1,214) on average than did both 2- and 2.5-star districts ($1,249) and 3-star ($1,140) districts spent less than 3.5-star districts ($1,160). See **Table 59**.

Unlike 2009-2010 which saw only one statistically significant relationship between administrative costs and FAST rating, significant relationships existed in 5 of

Table 60:
Distribution of Administrative Costs per Pupil by FAST Rating, 2010-2011

FAST Rating	Coefficient	Standard Error
1-star	1321.618***	91.47697
1.5-star	-107.7861	106.597
2-star	-72.98061	102.351
2.5-star	-72.24728	99.36497
3-star	-181.8413*	98.0607
3.5-star	-161.5393	100.409
4-star	-241.5337**	101.7725
4.5-star	-358.9166***	106.3069
5-star	-379.951***	121.2046

* p < .10, ** p < .05, *** p < .01

Table 61:
Ordered Logit Model of Administrative Costs per Pupil and District FAST Rating, 2010-2011

	Coefficient	Standard Error	Robust Standard Error
Total Admin. Costs per Pupil	-1.088089**	.4159841	.4680388
Avg. Salary of Campus Admin.	.0358072	.0286114	.034306
Average Salary of Central Admin.	.4187581	.3140919	.3617665
Total Campus Admin. (Percent)	.0372303	.0196071	.0318429
Total Central Admin. (Percent)	.0891961**	.0446086	.0450346
Total Enrollment Count	.1046123	.0643568	.0703883
Percent Eco. Disadvantaged	-.0275493***	.0028934	.0031296

* p < .10, ** p < .05, *** p < .01

the nine categories of FAST. The regression analysis of administrative spending per pupil showed that like 2008-2009, a statistically significant relationship (p < .01) existed between 4.5- and 5-star districts and FAST rating, while 3-star districts showed a relationship at the p < .10 level and 4-star districts were at the p < .05 level. See **Table 60**.

The ordered logistic analysis showed that, as was the case in 2008-09 and 2009-2010, a negative, statistically significant relationship (p < .05) existed between the total administration costs per pupil and FAST rating. Also as with both 2008-09 and 2009-10, there was a positive, statistically significant relationship between the percent of central office administrators and the total enrollment of the district. Again in 2010-11, the percent of students who were economically disadvantaged displayed a negative, statistically significant effect on FAST rating. These findings are contrary to the work of Rassouli-Currier (2011) who found that there was no relationship between administrative costs and efficiency. Once again, the Chi-squared test performed on 2010-

11 data showed that the probability of having a greater Chi-squared test statistic was 0.00. See **Table 61**.

Multiyear FAST Data Analyses

The findings for the pooled FAST data were different than any of the three individual years in that all of the independent variables were found to have a statistically significant effect on FAST rating. Total administrative costs per pupil had a negative, statistically significant relationship with FAST rating which verified that more efficient districts and charter schools spend less on administrative costs than do less efficient districts. Unlike the individual year analyses, the multiyear analysis showed that both the average salary of campus administrators and the percent of campus level administrators had a positive correlation with FAST rating, while a negative, statistically significant relationship was present for central office administrators. Larger districts continued to be positively associated with efficiency and the percent of students who were economically

Table 62:
Ordered Logit Model of Administrative Costs per Pupil and District FAST Rating, 2008-2011

	Coefficient	Standard Error	Robust Standard Error
Total Admin. Costs per Pupil	-.6152813***	.1147283	.113967
Avg. Salary of Campus Admin.	.0363481**	.0170265	.0165636
Average Salary of Central Admin.	-.0420394**	.0182957	.0178305
Total Campus Admin. (Percent)	.0256593*	.0104274	.0134985
Total Central Admin. (Percent)	-0811228***	.0252745	.0267617
Total Enrollment Count	.0388692***	.0308836	.0320343
Percent Eco. Disadvantaged	-.0249238***	.0016495	.0017929
School Year 2	.0768228	.0737684	.0735174
School Year 3	.0959559	.0737326	.0728984

* p < .10, ** p < .05, *** p < .01

disadvantaged was negatively correlated with FAST ratings. As with each of the previous years, the Chi-squared test yielded that the probability of having a greater Chi-square test statistic was 0.00. See **Table 62**.

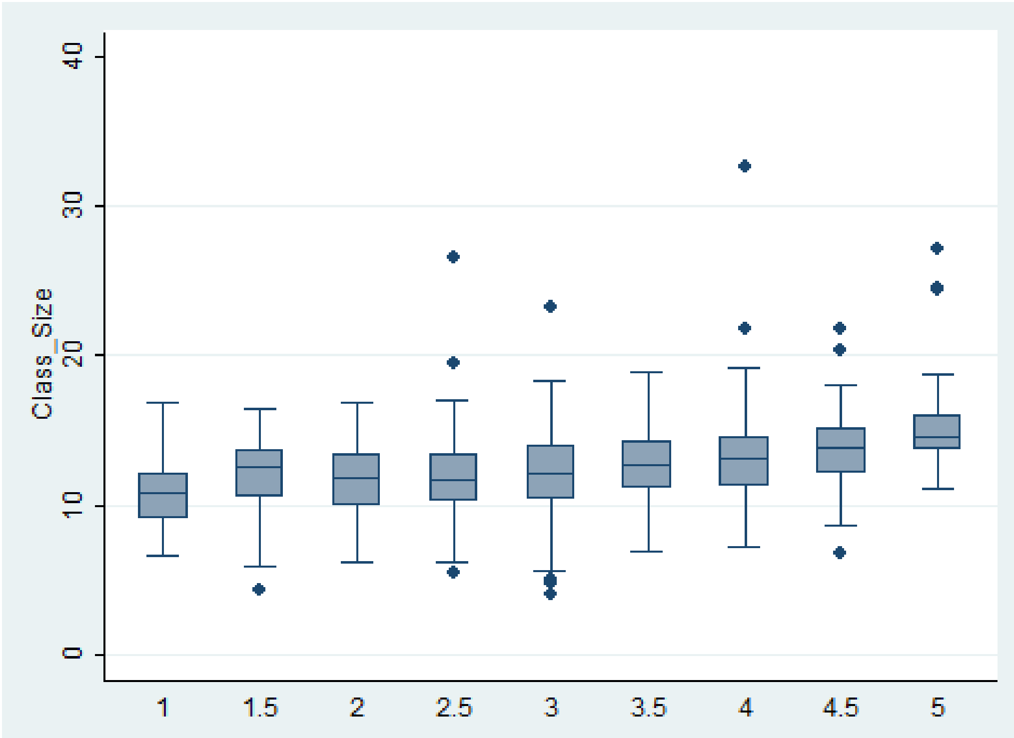
Student Teacher Ratio as a Predictor of Efficiency

In 1984, the state of Texas implemented a policy restricting class size to 22:1 for students in kindergarten through the fourth grade under the assumption that limiting the size of a class would improve the education of students (Scharrer, 2009). Studies (Cho, Glewee, & Whilter, 2012; Hoxby, 2000; Jepsen & Rivkin, 2009) on the effect of class size on achievement have been mixed. Cho, Glewwe, and Whitler (2012) found that class size had a positive effect on reading and math scores in Minnesota but that the effects were minimal. While Jepsen and Rivkin (2009) found that smaller class size does have a slightly positive effect on student achievement, those effects were often negated by the poor quality of the new teachers hired to fill positions, especially in schools with high populations of economically disadvantaged students. Hoxby (2000) found that small class size had statistically significant effect on student achievement. Due to the continued debate, it was of interest to learn whether student/teacher ratio was a predictor in the FAST rankings of school districts and charter schools and was therefore included as a variable of this study.

2008-2009 Data Analyses

In the 2008-2009 school year, there were 1,130 school districts and charter schools which were rated by the FAST. Those districts and charter schools had an average classroom size of 12. 42 students per teacher, with a minimum number of 4.09

Figure 18:
Student/Teacher Ratio, 2008-2009



and a maximum of 32.63. As with prior data, a box and whisker graph was created to help determine the existence of outliers within the data. It was determined that districts and charter schools with a student/teacher ratio of greater than 25.9 to 1 could be considered outliers because they were greater than 5 standard deviations above the mean and were therefore removed from the data. A total of 4 outliers were removed from the data. See **Figure 18**.

Once the outliers were removed, the data was divided into the 9 categories of the FAST and their measures of central tendency were calculated. There was a clear trend

Table 63:
Student/Teacher Ratio by FAST Rating, 2008-2009

FAST Rating	# Obs	Mean	Standard Deviation	Min.	Max
All	1,130	12.41594	2.709262	4.086779	32.625
1-star	24	10.87613	2.577209	6.640106	16.85828
1.5-star	83	11.96726	2.419396	4.285786	16.45011
2-star	145	11.71921	2.438839	6.231676	16.88772
2.5-star	200	11.67599	2.355887	5.46827	19.5032
3-star	225	12.14209	2.62873	4.086779	23.18025
3.5-star	186	12.6179	2.253545	6.960557	18.95034
4-star	136	13.01865	2.537088	7.264308	21.85714
4.5-star	86	13.67132	2.357095	6.714046	21.838
5-star	42	14.99573	2.703911	11.15807	24.52644

that districts rated more efficient by the FAST had larger student/teacher ratios than less efficient school districts and charter schools. While 1-star districts had the highest student/teacher ratio at 10.87 to 1, 5-star districts had the lowest student/teacher ratio at 15 to 1. The average student teacher ratio increased almost half a student per teacher between 2-star districts and 5-star districts. These findings suggested that as the student/teacher ratio increases, the efficiency of a district or charter school increases. See **Table 63**.

Once the central tendencies were calculated, a regression analysis was conducted to determine if any statistically significant relationships existed within the data. It was found that statistically significant relationships were present in 7 of the 9 FAST categories. See **Table 64**.

Once the regression was completed, an ordered logit was prepared to control for other factors which might affect the student/teacher ratio. As with all previous variables, the total enrollment count of the district or charter school was included, as well as the

Table 64:
Student/Teacher Ratio by FAST Rating, 2008-2009

FAST Rating	Coefficient	Standard Error
1-star	10.87613***	.5005263
1.5-star	1.091126**	.5683027
2-star	.8430813	.5403638
2.5-star	.7998552	.5297072
3-star	1.265959**	.5265447
3.5-star	1.741766***	.5318388
4-star	2.142522***	.542897
4.5-star	2.795188***	.566075
5-star	.41196***	.6274429

* p < .10, ** p < .05, *** p < .01

percent of students who were economically disadvantaged. The data showed that, even when controlling for total enrollment count and the percent of students who were economically disadvantaged, the student/teacher ratio continued to have a positive, statistically significant effect on FAST rating. See **Table 65**.

While the studies from both Cho, Glewwe, and Whitler (2012) and Jepsen and Rivkin (2009) indicated that smaller class size does increase student achievement, both noted that the gains were minimal. The findings presented in the 2008-2009 data was that the efficiency of a district increased as student/teacher ratio increased. The Chi-

Table 65:
Ordered Logit Model of Student/Teacher Ratio and District FAST Rating, 2008-2009

	Coefficient	Standard Error	Robust Standard Error
Student/Teacher Ratio	.2139609***	.0284965	.03212
Total Enrollment Count	-.009623	.0473592	.0534855
Percent Eco. Disadvantaged	-.0248805***	.002781	.0030132

* p < .10, ** p < .05, *** p < .01

squared test presented that the probability of having a greater Chi-squared test statistic is 0.00. These findings were consistent with the research of Cho, Glewwe, and Whitler (2012) and Jepsen and Rivkin (2009) in that the additional costs of reducing class size may not be the most efficient way for districts to spend money.

2009-2010 Data Analyses

Following the same procedures of 2008-2009, the 2009-2010 FAST data were analyzed to determine what effect, if any, student/teacher ratio has on efficiency. In 2009-10, there were 1,137 school districts and charter schools which were rated by the FAST. The average student/teacher ratio in 2009-10 was 12.46 students per teacher, with a minimum number of students of 3.92 and a maximum of 31.64. Prior to analyses, a box and whisker plot was created to search for outliers. It was determined that student teacher ratios of greater than 26.08 to 1 were greater than 5 standard deviations above

Figure 19:
Student/Teacher Ratio, 2009-2010

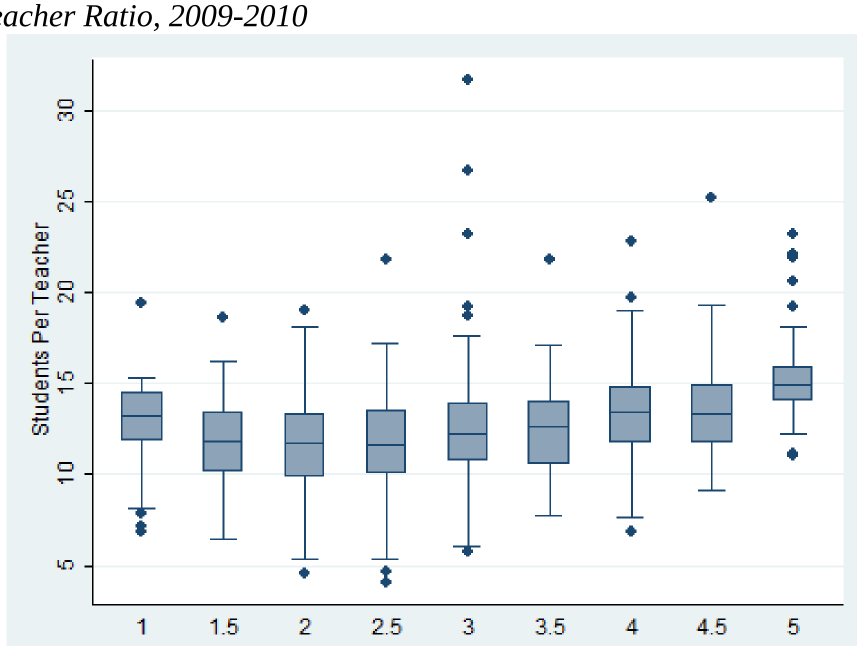


Table 66:
Student/Teacher Ratio by FAST Rating, 2009-2010

FAST Rating	# Obs	Mean	Standard Deviation	Min.	Max
All	1,137	12.4696	2.721841	4.079837	31.63838
1-star	37	12.56934	2.596544	6.832688	19.41934
1.5-star	89	11.6724	2.4939	6.439805	18.60315
2-star	142	11.66817	2.580788	4.600644	19.0032
2.5-star	199	11.70972	2.619494	4.079837	21.82546
3-star	216	12.31842	2.501634	5.773005	23.16928
3.5-star	163	12.42372	2.319112	7.781535	21.80131
4-star	139	13.24604	2.370773	6.88055	22.7697
4.5-star	104	13.441	2.432331	9.091955	25.17647
5-star	46	15.39097	2.2617335	11.06173	23.18161

the mean and were removed from the data set. A total of two observations were removed from the data. See **Figure 19**.

Once outliers were removed, the data was sorted into the 9 categories of the FAST and the measures of central tendency were calculated. Overall, 5-star districts had the highest average student/teacher ratio (15.39) followed by 4.5-star (13.44) and then 4-star districts (13.24). The next highest student/teacher ratio was 3.5-star districts at 12.42 to 1. The fact that 1-star districts did not have the highest student/teacher ratio and was the lowest rated by the FAST seemed to confirm the finding Hoxby(2000) who found that class size had no statistical significance in relation to student achievement. The overall trend was that as student/teacher ratio increased, efficiency as rated by the FAST increased as well. See **Table 66**.

Once the measures of central tendency were established, a linear regression was completed to determine if the changes in the data regarding student/teacher ratio were significant. As with 2008-09, 5-star districts showed a positive, statistically significant (p

Table 67:
Student/Teacher Ratio by FAST Rating, 2009-2010

FAST Rating	Coefficient	Standard Error
1-star	12.56934***	.4098381
1.5-star	-.8969459*	.4876436
2-star	-.9311766**	.4601449
2.5-star	-.859628*	.4463153
3-star	-.2509281	.4435531
3.5-star	-.1456253	.4539766
4-star	.6766956	.4611702
4.5-star	.8716588*	.4772052
5-star	2.821629***	.5505191

* p < .10, ** p < .05, *** p < .01

< .01) between student/teacher ratio and FAST rating. A positive relationship (p < .10) was also found in 4.5-star districts. However unlike 2008-09, 1.5-star districts displayed a negative correlation between student/teacher ratio and FAST rating, meaning that as class size went down FAST rating increased. Also different from 2008-09 data, there was no statistical significance relationship between 3-, 3.5-, and 4-star districts and FAST ratings, See **Table 67**.

The final step in the process was to execute an ordered logit on the data to determine to what extent, if any, student-teacher ratio had when controlling for the size of the district. As with 2008-09, student/teacher ratio continued to display a positive, statistically significant (p < .01) correlation with FAST rating and the percent of students who were economically disadvantaged continued to present a negative correlation (p < .01). However, 2009-10 data did report a negative, statistically significant relationship (p < .01) between the district size and FAST rating. This finding ran contrary to many of the variables already analyzed as part of this study, as well as the findings in 2008-09.

Table 68:
Ordered Logit Model of Student/Teacher Ratio and District FAST Rating, 2009-2010

	Coefficient	Standard Error	Robust Standard Error
Student/Teacher Ratio	.2460255***	.0276862	.0326795
Total Enrollment Count	-.0998216*	.046423	.0540988
Percent Eco. Disadvantaged	-.0292424***	.002898	.002868

* p < .10, ** p < .05, *** p < .01

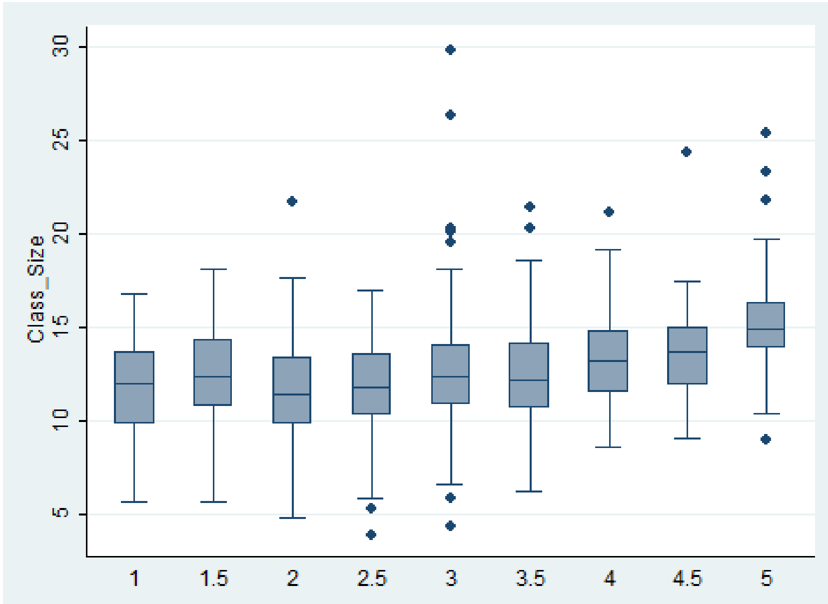
This difference may be attributed to the fact that larger districts have smaller class sizes than smaller districts who often seek waivers to avoid the 22:1 ratio required by the state in elementary classes. The Chi-squared test indicated that the probability of having a greater Chi-squared test statistic is 0.00. See **Table 68**.

2010-2011 Data Analyses

In the final year of FAST data, there were 1,135 school districts and charter schools which were rated by the FAST with an average student/teacher ratio of 12.52 students per teacher. The smallest student/teacher ratio was 3.91 students per teacher and the maximum ratio was 29.79. A box and whisker plot was created to determine outliers, and it was gauged that districts and charter schools with an average of greater than 26.08 students per teacher were greater than 5 standard deviations above the mean and could be considered outliers. There were two school districts or charter schools which were removed from the data set. See **Figure 20**.

As with prior years, the data were separated into the 9 categories of the fast and the measures of central tendency were calculated. Once again, 5-star districts produced the highest student/teacher ratio of all the categories with a ratio of 15.37 students per teacher, which as almost 30% more than 1-star districts (11.51). Again, the trend showed

Figure 20:
Student/Teacher Ratio, 2010-2011



a slight uptick on the number of students per teacher from 1-star to 5-star districts, though 2- and 2.5-star districts once again had a lower student/teacher ratio than 1.5-star districts (though both ratios were greater than 1-star districts). See **Table 69**.

Table 69:
Student/Teacher Ratio by FAST Rating, 2010-2011

FAST Rating	# Obs	Mean	Standard Deviation	Min.	Max
All	1,135	12.51831	2.712983	3.916406	27.79511
1-star	35	11.5145	2.870206	5.70345	16.77461
1.5-star	95	12.25857	2.519243	5.689724	18.15503
2-star	136	11.65693	2.612879	4.856865	21.75735
2.5-star	190	11.76368	2.443021	3.916406	17.01695
3-star	227	12.37361	2.424158	4.384042	20.28595
3.5-star	166	12.44708	2.632933	6.240396	21.39905
4-star	142	13.24126	2.334969	8.576939	21.14266
4.5-star	97	13.57982	2.207168	9.08905	24.31599
5-star	45	15.37016	3.081979	9.02351	25.39153

Table 70:
Student/Teacher Ratio by FAST Rating, 2010-2011

FAST Rating	Coefficient	Standard Error
1-star	11.5145***	.4234078
1.5-star	.7440682	.4953004
2-star	.1424219	.4747746
2.5-star	.2491754	.4607584
3-star	.8591094*	.4548797
3.5-star	.9325767**	.4659108
4-star	1.726758***	.4727171
4.5-star	2.06532***	.4939238
5-star	3.855652***	.5645437

* p < .10, ** p < .05, *** p < .01

Much like 2008-09, 3- to 5-star districts all had a positive, statistically significant relationships with student/teacher ratio and increased FAST ratings. Unlike 2009-10, there were no negative correlations between the two. Again, these findings are supportive to the findings of Cho, Glewwe, and Whitler (2012) and Jepsen and Rivkin (2009) that indicated that the minimal gains in student achievement due to a reduction of class size may not be worth the overall cost. See **Table 70**.

The final step in the analyses was to create an ordered logit regression to include district size and economic status of students. Like 2008-09, student/teacher ratio exhibited a positive, statistically significant ($p < .01$) relationship while the percent of economically disadvantaged students had a negative relationship. However, 2010-11 data yielded a negative, statistically significant relationship ($p < .01$) between the district's size and the FAST ratings. Once can assume that this negative relationship between district size and student/teacher ratio indicated that larger districts do not necessarily have larger student/teacher ratios. It might have been the case that larger

Table 71:
Ordered Logit Model of Student/Teacher Ratio and District FAST Rating, 2010-2011

	Coefficient	Standard Error	Robust Standard Error
Student/Teacher Ratio	2.603378***	.0291943	.0310676
Total Enrollment Count	-.1601308***	.0484933	.0520911
Percent Eco. Disadvantaged	-.032282***	.0028437	.0029378

* p < .10, ** p < .05, *** p < .01

districts had a larger pool of teachers from which to hire and were able to keep classroom size to a minimum. As has been found consistently, the percent of students who were economically disadvantaged showed a negative, statistically significant relationship. The Chi-squared test indicated that the probability of having a greater Chi-squared test statistic is 0.00. See **Table 71**.

Multiyear FAST Data Analyses

As has been done with prior variables, the three years of FAST data were pooled and analyzed as a way to verify if the findings from individual year analyses could be seen across all three years of FAST ratings. The ordered logistic regression of the pooled data indicated that class size has a positive, statistically significant ($p < .01$) relationship with overall efficiency, meaning that larger class sizes lead to more efficiency in school districts and charter schools. This finding confirmed the results from each individual year. In addition, the overall enrollment of a district or charter school was negatively correlated ($p < .01$) to efficiency when controlling for class size. Again, this was the first time that enrollment size was seen to be negative factor for efficiency. This finding

Table 72:
Ordered Logit Model of Student/Teacher Ratio and District FAST Rating, 2008-2011

	Coefficient	Standard Error	Robust Standard Error
Student/Teacher Ratio	.4262481***	.0162114	.0183444
Total Enrollment Count	-.0972672***	.0271867	.0307399
Percent Eco. Disadvantaged	-.0283959***	.001613	.0016858
School Year 2	.0749126	.0740585	.0744803
School Year 3	.072203	.0739236	.0735394

* p < .10, ** p < .05, *** p < .01

implied that larger districts have smaller class sizes which were negatively associated efficiency. Consistent with the findings of the previous variables analyzed, the percent of students who were economically disadvantaged continued to show a negative correlation with efficiency, meaning that as the percent of students who were economically disadvantaged increased the efficiency of those districts or charter schools decreased. Finally, the Chi-squared test showed that the probability of having a greater Chi-squared test statistic was 0.00; therefore, one can reject the hypothesis that the student/teacher ratio is irrelevant to efficiency. See **Table 72**.

Teacher Experience as an Predictor of FAST

Much like the debate over administrative spending and the effect of class size on student achievement, there is continued debate over whether students who are taught by more experienced teachers perform better than their peers. Similar to many issues in education, the research has produced mix results. For example, the research of Kukla-Acevedo (2009) indicated that teacher experience had a positive impact on student achievement in for a variety of students, including African American students, White students, and low-SES students. Ronfeldt, Loeb, and Wyckoff (2011) observed that there was a disruptive effect from teacher turnover in that the ELA and math scores were lower in grade-levels with higher turnover rates. Conversely, the research of Hanushek and Rivkin (2010) found evidence that high turnover rates for teachers was not as damaging as many suggest because the turnover rate resulted mainly from ineffective teachers leaving the school system. As a result of the continued debate, teacher characteristics including total overall experience, years of experience, average years with a district, and teacher turnover rate were included in this study.

2008-2009 Data Analyses

Following the same methods as with the previous factors of efficiency analyzed in this study, the effect of teacher experience on the FAST ratings of districts and charter school was analyzed. In 2008-09, there were 327,663 teachers in the state of Texas. Those teachers had an average of 11.77 years of experience. Prior to the calculations, a

Figure 21:
Average Teacher Experience, 2008-2009

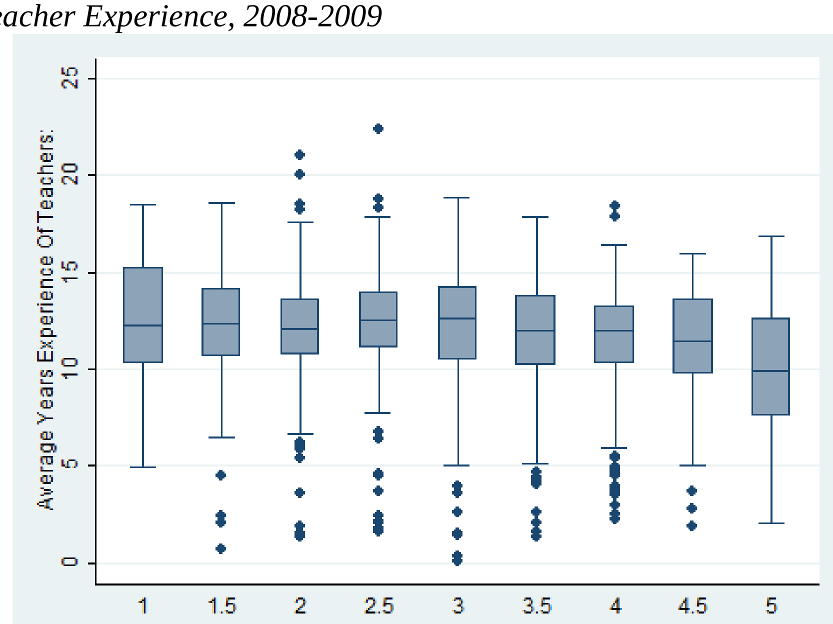


Table 73:
Average Teacher Experience by FAST Rating, 2008-2009

FAST Rating	# Obs	Mean	Standard Deviation	Min.	Max
All	1,130	11.76792	3.256759	.0992989	22.37462
1-star	24	12.43106	3.233529	4.910007	18.52632
1.5-star	83	12.04105	3.225523	.6973753	18.62198
2-star	145	11.87896	3.313507	1.335018	21
2.5-star	201	12.18552	3.051057	1.643538	22.37462
3-star	225	12.15384	3.334171	.0992989	18.86667
3.5-star	186	11.63884	3.076356	1.367482	17.87097
4-star	137	11.24659	3.437955	2.230769	18.38554
4.5-star	86	11.27467	2.888178	1.90341	16
5-star	43	9.730722	3.631793	2.058824	16.86207

box and whisker plot was created to help determine the existence of outliers. It was determined that districts and charter schools which had an average teacher experience of greater than 28.1 years would be considered outliers and were removed from the data. There were no observations removed for the 2008-09 school year. See **Figure 21**.

Districts and charter schools were divided into the 9 categories of the FAST and were analyzed for their measures of central tendency. It was found that 1-star districts had the highest average teacher experience with a mean of 12.43 years of experience. Conversely, the most efficient districts as rated by the FAST had the lowest average years of experience at 9.73 years. All other categories had an average range of between 11.24 years (4-star districts) and 12.18 years (2.5-star districts). See **Table 73**.

Once the measures of central tendency were calculated, a regression analysis was performed to see if there were any statistically significant differences which occurred between the ratings. It was determined that only 5-star districts had a statistically

Table 74:
Average Teacher Experience by FAST Rating, 2008-2009

FAST Rating	Coefficient	Standard Error
1-star	12.43106***	.6515851
1.5-star	-.3900108	.7470807
2-star	-.5521005	.7103527
2.5-star	.2455449	.6961582
3-star	-.2772175	.6921865
3.5-star	-.7922253	.699146
4-star	-1.184467*	.713292
4.5-star	-1.156391	.7441523
5-star	-2.700339***	.8213303

* p < .10, ** p < .05, *** p < .01

significant difference within the rating at the $p < .01$ level. Also, 4-star districts, which had the second lowest overall mean value, were statistically significant at the $p < .10$ level. No statistically significant differences were found in the other categories of the FAST. See **Table 74**.

The final step in the process was to complete an ordered logit regression analysis to control for a variety of factors which may have an effect on the overall average years of experience of teachers within a district or charter school. Factors included in the ordered logit included the teacher turnover rate, and the percent of new teachers, teachers with 1-5 years experience, 6-10 years experience, and 11-20 years of experience, as well as the size of the district or charter school and the percentage of student who were economically disadvantaged. When including those independent variables, overall teacher experience did have a negative, statistically significant relationship with the FAST rating. However, there was no statistically significance found between the teacher turnover rate or the percentage of teachers at each level of

Table 75:
Ordered Logit Model of Average Teacher Experience and District FAST Rating, 2008-2009

	Coefficient	Standard Error	Robust Standard Error
Average Years of Experience	-.194566**	.0880723	.0866318
Teacher Turnover Rate	-.0086534	.0066358	.0072032
% Beginning Teachers	-.0284701	.0256671	.0259039
% Teacher 1-5 yrs. Experience	-.0071448	.023013	.023172
% Teacher 6-10 yrs. Experience	.0115642	.0197642	.0204136
% Teachers 11-20 yrs. Experience	.0034442	.0140234	.014829
Total Enrollment Count	.1756016***	.0381559	.038997
Percent Eco. Disadvantaged	-.0240709***	.0029348	.0030634

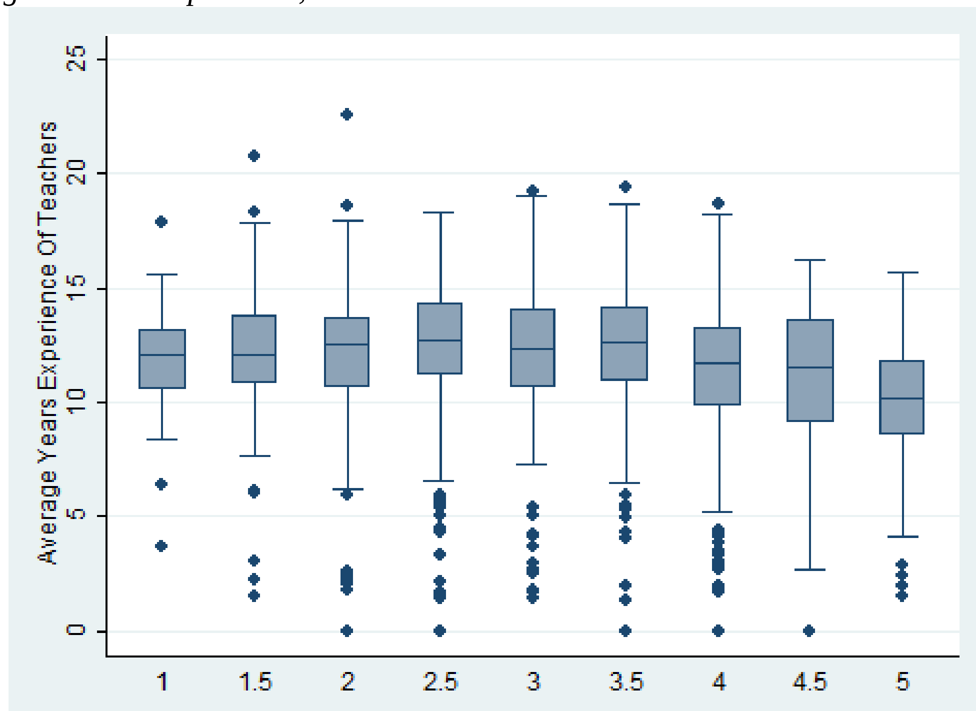
* $p < .10$, ** $p < .05$, *** $p < .01$

experience. The Chi-squared test found that the probability of a greater Chi-squared statistic was 0.00. These findings support the conclusions of Hanushek and Rivkin (2010) who found that teacher turnover did not have a negative effect on student achievement. As with all of the previous variables examined in this study, the percent of students who were economically disadvantaged continued to have a statistically significant ($p < .01$), negative effect on FAST efficiency. Also, it was observed that there was a positive, statistically significant ($p < .01$) relationship between the size of a district and its rating, indicating that larger districts were more efficient than smaller districts. See **Table 75**.

2009-2010 Data Analyses

The same methods that were used for the 2008-09 analyses were used when studying the 2009-2010 FAST data. In 2009-10, there were 333,007 teachers in the state of Texas with an average experience of 11.84 years. As with 2008-09, the box and whisker plot indicated that districts and charter schools whose teachers had an average of

Figure 22:
Average Teacher Experience, 2009-2010



greater than 28.7 years of experience could be considered outliers. No district charter school met that threshold. However, 2009-10 data indicated that there were 6 school districts or charter schools with an average teacher experience of zero years. It was also decided to remove these observations from the data as being outliers. See **Figure 22**.

Once the observations were removed from the data, the data were sorted into the 9 categories of the FAST and the measures of central tendency were calculated. As in 2008-09, 5-star districts were found to have the lowest average experience with a mean value of 9.63 years. 1-star districts, which had the highest average experience in 2008-09, had the third lowest average experience at 11.82 years, while 2.5-star districts had the highest average experience at 12.42 years. This change in data indicated that, as was

Table 76:
Average Teacher Experience by FAST Rating, 2009-2010

FAST Rating	# Obs	Mean	Standard Deviation	Min.	Max
All	1,137	11.7835	3.00423	0	22.55556
1-star	37	11.81908	2.60109	3.699809	17.8296
1.5-star	89	12.13279	3.085371	1.539393	20.77778
2-star	141	12.15139	3.289825	1.7588	22.55556
2.5-star	198	12.41986	3.130556	1.452111	18.34211
3-star	218	12.01545	3.366756	1.4	19.2
3.5-star	162	12.18392	3.087769	1.375	19.37931
4-star	137	11.19652	3.531458	1.672465	18.67974
4.5-star	103	11.04954	3.277437	2.653846	16.27586
5-star	46	9.631648	3.416097	1.560606	15.74255

found when running the logistic regression in 2008-09, the average experience of teachers had little overall effect on the efficiency of a school district. See **Table 76**.

Once the measures of central tendency were gauged, a logistic regression was completed to determine the statistical significance of the data sets. The logistic regression yielded similar results in 2009-2010 in that 5-star districts did have a positive, statistically significant relationship ($p < .01$) with the overall FAST rating. Unlike the previous year's data, there was not a statistically significant relationship with any of the other categories of the FAST. See **Table 77**.

Again, the final step in the process was to complete an ordered logit regression to determine whether factors other than average years of experience yielded statistically significant results. The same variables—experience, turnover rate, percentage of teachers at different levels of experiences—were used as controlling factors. Unlike 2008-09, the overall experience of teachers had no statistical significance. However, the teacher turnover rate did have a negative, statistically significant ($p < .01$) effect on

Table 77:
Average Teacher Experience by FAST Rating, 2009-2010

FAST Rating	Coefficient	Standard Error
1-star	11.81908***	.5340179
1.5-star	.3136566	.6353984
2-star	.3323172	.600007
2.5-star	.6007794	.5817778
3-star	.1963736	.5775608
3.5-star	.3648443	.591868
4-star	-.6225619	.6018249
4.5-star	-.7695378	.6225887
5-star	-2.187429***	.717325

* p < .10, ** p < .05, *** p < .01

overall FAST rating, which appeared to support the findings of Ronfeldt, Loeb, and Wyckoff (2011) of the negative effects of teacher turnover on achievement. Again different from 2008-09 was the fact that the percent of teachers with 6-10 years experience and the percent of teachers with 11-20 years experience was positively

Table 78:
Ordered Logit Model of Average Teacher Experience and District FAST Rating, 2009-2010

	Coefficient	Standard Error	Robust Standard Error
Average Years of Experience	-.0828048	.0886347	.0912313
Teacher Turnover Rate	-.0261323***	.0073028	.0078769
% Beginning Teachers	.0243551	.0264518	.0267479
% Teacher 1-5 yrs. Experience	.0297685	.0233306	.0235346
% Teacher 6-10 yrs. Experience	.0457699**	.019895	.0189345
% Teachers 11-20 yrs. Experience	.0267976**	.0138511	.0134739
Total Enrollment Count	.0787752*	.0389697	.0410458
Percent Eco. Disadvantaged	-.0292249***	.0030782	.0032514

* p < .10, ** p < .05, *** p < .01

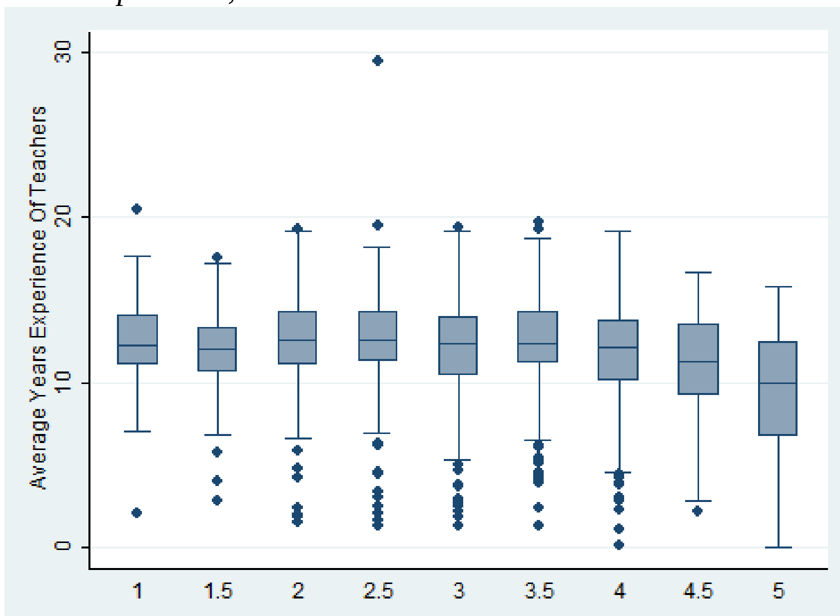
related to FAST rating, suggesting that more experienced teachers produce higher results in their students. It was once again noted that the overall district size had a positive effect on efficiency at the $p < .10$ level while the percent of economically disadvantaged students had the same negative effect ($p < .01$). Finally, the Chi-squared test presented a probability of having a greater Chi-square test statistic of 0.00. As a result, one can reject the hypothesis that that Teacher Experience is irrelevant to the efficiency of a school district. See **Table 78**.

2010-2011 Data Analyses

The final year of FAST data showed that the number of teachers in the state rose slightly to 334,843. These teachers had an average experience of 11.84 years, with the maximum average at 29.5 years of experience. The box and whisker plot showed that, as with the previous two years, districts and charter schools with an average of greater than 28.7 years of experience could be considered outliers because they were more than 5 standard deviations above the mean. There were 4 districts with an average of zero years experience. The one district or charter school with greater than 28.7 years experience was removed, as were the 4 districts with zero years experience. See **Figure 23**.

Once divided into the categories of the FAST, the findings in 2010-11 were much more similar to the findings of 2008-09 in that 2010-11 once again showed that 5-star districts average the fewest years of experience of all the categories, while 1-star districts and charter schools had the highest average at 12.49 years. 4.5-star districts had the second lowest average years experience for their teachers, again suggesting that districts and charter schools which have less experienced teachers are more efficient.

Figure 23:
Average Teacher Experience, 2010-2011



Based on the findings of these two years, it could be inferred that the increased salary costs that were a direct result of increased teacher experience did not lead to greater efficiency. See **Table 79**.

Table 79:
Average Teacher Experience by FAST Rating, 2010-2011

FAST Rating	# Obs	Mean	Standard Deviation	Min.	Max
All	1,131	11.84464	3.315054	0	29.5
1-star	35	12.49498	3.047886	1.996214	20.41663
1.5-star	95	11.90628	2.499357	2.833333	17.59259
2-star	136	12.28697	3.284545	1.485923	19.29539
2.5-star	189	12.34855	3.080549	1.295974	19.53377
3-star	229	11.80257	3.351205	1.316667	19.35328
3.5-star	166	12.30228	3.269594	1.333333	19.68966
4-star	142	11.44515	3.521784	.0900901	19.13908
4.5-star	97	10.70435	3.55868	2.121657	16.65625
5-star	42	9.868022	3.655371	1.429761	15.7561

Table 80:
Average Teacher Experience by FAST Rating, 2010-2011

FAST Rating	Coefficient	Standard Error
1-star	12.49498***	.5523386
1.5-star	-.5887062	.6461231
2-star	-.2080145	.6193469
2.5-star	-.1464306	.6013101
3-star	-.6924105	.5930477
3.5-star	-.1926979	.6077841
4-star	-1.04983*	.616629
4.5-star	-.1796031***	.6443272
5-star	-.262696***	.74787

* p < .10, ** p < .05, *** p < .01

After computing the measures of central tendency, a regression analysis was completed to determine the statistical significance of the findings. Once again, there was a statistically significant ($p < .01$) relationship between 5-star districts and FAST rating. Unlike the prior two years' data, 4.5-star districts showed statistical significance at the $p< .01$ level and 4-star districts showed significance at the $p < .10$ level. Again these findings show that there was a statistical significance in data which showed that teachers with less experience and FAST rating. See **Table 80**.

The final step in the process was to complete the ordered logit regression on the 2010-11 data. Findings were similar to the findings of the 2008-09 analyses which showed a negative, statistically significant relationship ($p < .01$) between overall teacher experience and FAST rating. Unlike 2009-10, the teacher turnover rate was no longer a statistically significant predictor of FAST rating, nor were the experience levels of the teachers. The size of the district continued to show a positive relationship with the FAST rating, while the percent of students who were economically disadvantaged was once

Table 81:
Ordered Logit Model of Average Teacher Experience and District FAST Rating, 2010-2011

	Coefficient	Standard Error	Robust Standard Error
Average Years of Experience	-.2188567**	.0888994	.0865821
Teacher Turnover Rate	-.0140137	.0075278	.0075425
% Beginning Teachers	-.019258	.0260595	.0248303
% Teacher 1-5 yrs. Experience	-.0164881	.0232455	.0218541
% Teacher 6-10 yrs. Experience	-.0011077	.0195352	.01845
% Teachers 11-20 yrs. Experience	.0070161	.0140943	.0130703
Total Enrollment Count	.1030522***	.0380305	.0391184
Percent Eco. Disadvantaged	-.0313207***	.0030575	.0032321

* $p < .10$, ** $p < .05$, *** $p < .01$

again a negative predictor of efficiency. The Chi-squared test found that the likelihood of having a greater Chi-squared test statistic was 0.00. As with 2008-09, these findings were supportive of the work of Hanushek and Rivkin (2010) which found that teacher turnover had little to no effect on the overall scores of students and contradicted the findings of Ronfeldt, Loeb, and Wyckoff (2011) which claimed turnover rate has a negative effect on student achievement. See **Table 81**.

Multiyear FAST Data Analyses

After the individual year analyses were completed, the data were pooled into one larger data set to determine if the snapshots from individual years were found across all three years of FAST data. Findings from the pooled data revealed that average teacher experience had a negative, statistically significant ($p < .01$) correlation with overall FAST efficiency. Of note, teacher turnover rate, which was not statistically significant in two of the three individual years, was found to be statistically significant when the data

Table 82:
Ordered Logit Model of Average Teacher Experience and District FAST Rating, 2008-2011

	Coefficient	Standard Error	Robust Standard Error
Average Years of Experience	-.1704628***	.0511197	.0510745
Teacher Turnover Rate	-.0146948***	.0040865	.0043447
% Beginning Teachers	-.0096812	.0150336	.0149812
% Teacher 1-5 yrs. Experience	.0001266	.0133871	.0132003
% Teacher 6-10 yrs. Experience	.0170114	.0113873	.0111553
% Teachers 11-20 yrs. Experience	.0115655	.008067	.0079805
Total Enrollment Count	.1202846***	.0220882	.0227878
Percent Eco. Disadvantaged	-.0279501***	.0017402	.0018227
School Year 2	.0393956	.075296	.0753011
School Year 3	.0357693	.0755639	.0754447

* p < .10, ** p < .05, *** p < .01

were pooled. The negative coefficient indicated that as turnover rate decreased, FAST rating improved. This finding was supportive of the work of Ronfeldt, Loeb, and Wyckoff (2011) whose research indicated that high teacher turnover had a negative effect on student achievement. As has been the case with each of the variables studied so far, the total enrollment of the district or charter school continued to display a positive, statistically significant relationship with FAST rating while the percent of students who were economically disadvantaged continued to be a negative predictor of FAST rating. Finally, the Chi-squared test once again showed that the probability of having a greater Chi-square test statistic was 0.00 allowing for the rejection of the hypothesis that Teacher Experience was irrelevant to efficiency. See **Table 82**.

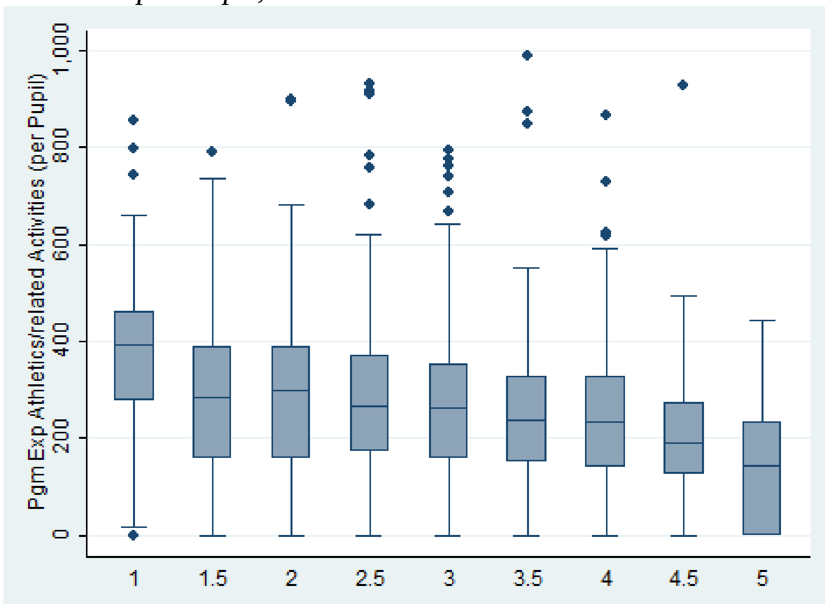
Cocurricular Spending per Pupil as a Predictor of Efficiency

Numerous reports throughout the last 20 years have found that there is a positive link between participation in extracurricular activities—specifically athletics—and self-concept and student achievement. Fejgin (1994) showed that athletic participation had positive effects on grades, self-concept, and educational aspirations. Broh (2002) had similar findings in his study which focused on African American participation in athletics. Lipscomb (2007) found that participation in athletics and/or clubs correlated with a 1% - 2% increase in math and science scores. Lumpkin and Favor (2012) found that high school athletes scored higher on state assessments than did non-athletes. While each of these studies showed a positive correlation between athletic participation and student achievement, very few studies have been conducted to determine if spending money in for athletics increased efficiency. As a result, athletic spending was included in this study.

2008-2009 Data Analyses

Data from the 2008-2009 FAST were analyzed using the same methods as done with prior variables. In that year, a total of 1,131 school districts and charter schools were rated by the FAST. Those rated spent an average of $262 per pupil on athletics, though 104 districts and charter schools had expenditures of $0 on athletics. A box and whisker plot was created to help determine the existence of outliers. It was found that districts spending over $1,124 per student on athletics could be considered outliers because they spent more than 5 standard deviations above the mean. However, there were no data observations which met the 5 standard deviation threshold, so no

Figure 24:
Extracurricular Costs per Pupil, 2008-2009



observations were removed as outliers. See **Figure 24**.

After the outliers were removed from the data, the data were divided into the 9 categories of the FAST and the measures of central tendency were calculated. The data

Table 83:
Extracurricular Costs per Pupil by FAST Rating, 2008-2009

FAST Rating	# Obs	Mean	Standard Deviation	Min.	Max
All	1,131	$262	172.4437	$0	$988
1-star	24	$401	218.9851	$0	$855
1.5-star	83	$291	179.4956	$0	$791
2-star	145	$298	188.8299	$0	$899
2.5-star	201	$281	177.9278	$0	$933
3-star	225	$262	164.3397	$0	$794
3.5-star	186	$249	157.5789	$0	$988
4-star	138	$243	161.4302	$0	$866
4.5-star	86	$207	145.2746	$0	$927
5-star	43	$142	122.0127	$0	$444

Table 84:
Regression of Extracurricular Costs per Pupil by FAST Rating, 2008-2009

FAST Rating	Coefficient	Standard Error
1-star	401.125***	34.38832
1.5-star	-109.7033***	39.04486
2-star	-103.3181***	37.12533
2.5-star	-120.9337***	36.38348
3-star	-139.3828***	36.17591
3.5-star	-152.1626***	36.53963
4-star	-158.596***	37.25881
4.5-star	-194.4622***	38.89181
5-star	-259.0785***	42.92538

* $p < .10$, ** $p < .05$, *** $p < .01$

showed a clear trend that as FAST rating increased, the athletic spending per pupil decreased. The only exception was that 2-star districts spent $7 more per pupil than did 1.5-star districts. 1-star districts spent the most at $401 per student while 5-star districts spent the least amount at $142 per pupil. See **Table 83**.

Once the measures of central tendency were calculated, a regression was done to determine the statistical significance of the differences within the categories. It was found that a statistically significant relationship existed between each of the categories of the FAST. All categories showed a statistical significance at the $p < .01$ level. See **Table 84**.

The final step in the process was to conduct an ordered logit regression to determine the effect, if any, that athletic spending per pupil had on the FAST rating. In addition to including athletic expenditures per pupil as an independent variable, the total enrollment count of the district was inputted as an independent variable, as well as the

Table 85:
Ordered Logit Model of Extracurricular Costs per Pupil and District FAST Rating, 2008-2009

	Coefficient	Standard Error	Robust Standard Error
Athletic Spending per Pupil	-.1861129***	.0322196	.0363658
Total Enrollment Count	.2602081***	.0361587	.0376287
Percent Eco. Disadvantaged	-.0246729***	.0027643	.0029937

* p < .10, ** p < .05, *** p < .01

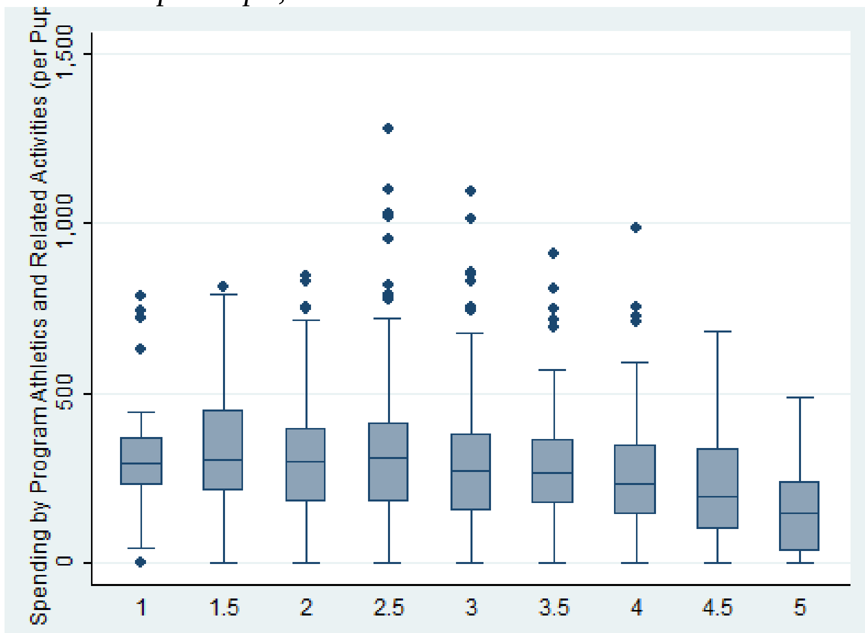
percent of students who were economically disadvantaged. The ordered logit regression showed that athletic spending per pupil had a negative, statistically significant relationship with FAST rating at the p < .01 level. As was seen in other variables, there was a positive relationship (p < .01) between total enrollment and a negative relationship (p < .01) with the percentage of low-SES students. Finally, the Chi-squared test indicated that the probability of having a greater Chi-squared statistic was 0.00. Therefore, the hypothesis is rejected that Extracurricular Costs were irrelevant to a district's efficiency. See **Table 85**.

2009-2010 Data Analyses

In 2009-2010, there were 1,138 school districts and charter schools that were rated by the FAST. The average spending per pupil for those districts and charter school was $277 with 109 districts and charter schools spending $0 on athletics. A box and whisker plot showed that districts and charter schools expending more than $1,278 per student could be considered outliers as they spent more than 5 standard deviations above the mean. A total of one outlier was removed from the data set. See **Figure 25**.

Once the data set was developed, the data were divided into the 9 categories of the FAST and the measures of central tendency were calculated. Unlike 2008-09 in

Figure 25:
Extracurricular Costs per Pupil, 2009-2010



which more efficient districts showed a definite decrease in spending on athletics per pupil, the spending levels per pupil varied somewhat between the FAST categories. 1.5-star districts had the highest level of spending at $329 per pupil followed by 1-star

Table 86:
Extracurricular Costs per Pupil by FAST Rating, 2009-2010

FAST Rating	# Obs	Mean	Standard Deviation	Min.	Max
All	1,138	$277	186.2311	$0	$1,278
1-star	37	$316	174.3259	$0	$783
1.5-star	89	$329	189.7981	$0	$814
2-star	142	$298	187.5982	$0	$846
2.5-star	198	$314	200.1306	$0	$1,101
3-star	218	$277	186.272	$0	$1,095
3.5-star	163	$269	167.9321	$0	$909
4-star	140	$244	170.9565	$0	$988
4.5-star	104	$218	157.2373	$0	$680
5-star	46	$152	127.7206	$0	$487

Table 87:

Regression of Extracurricular Costs per Pupil by FAST Rating, 2009-2010

FAST Rating	Coefficient	Standard Error
1-star	316.4054***	29.59599
1.5-star	12.89797	35.21463
2-star	-18.71526	33.22885
2.5-star	-2.218537	32.24291
3-star	-38.90082	.320092
3.5-star	-41.11706	32.78341
4-star	-71.68398**	33.27787
4.5-star	-98.69387***	34.4084
5-star	-164.275***	39.75512

* $p < .10$, ** $p < .05$, *** $p < .01$

districts which had average spending at $316. 2.5-star districts spent more per student than did 2-star districts but only slightly. Once again, 5-star districts exhibited the lowest level of spending on athletics at $152 per pupil. See **Table 86**.

After the measures of central tendency were calculated, a regression analysis was conducted to help determine whether or there was any statistically significant differences within the findings. The results did show that as districts spent less there was a greater level of statistical significance in the relationship. 4-star districts spent an average of $71 less per pupil than did 1-star districts and had a significance at the $p < .05$ level. 4.5-star districts spent an average of $98 less per pupil had and a statistical significance at the $p < .10$ level. Finally, and 5-star districts spent $164 less than did 1-star districts and also had a statistical significance at the $p < .01$ level. These findings were similar to the findings in 2008-09 which showed that more efficient districts spend less per pupil on athletics than did less efficient districts. See **Table 87**.

Table 88:
Ordered Logit Model of Extracurricular Costs per Pupil and District FAST Rating, 2009-2010

	Coefficient	Standard Error	Robust Standard Error
Athletic Spending per Pupil	-.1919596***	.0311261	.0348335
Total Enrollment Count	.1963542***	.03529	.0356566
Percent Eco. Disadvantaged	-.0289358***	.0028248	.0029675

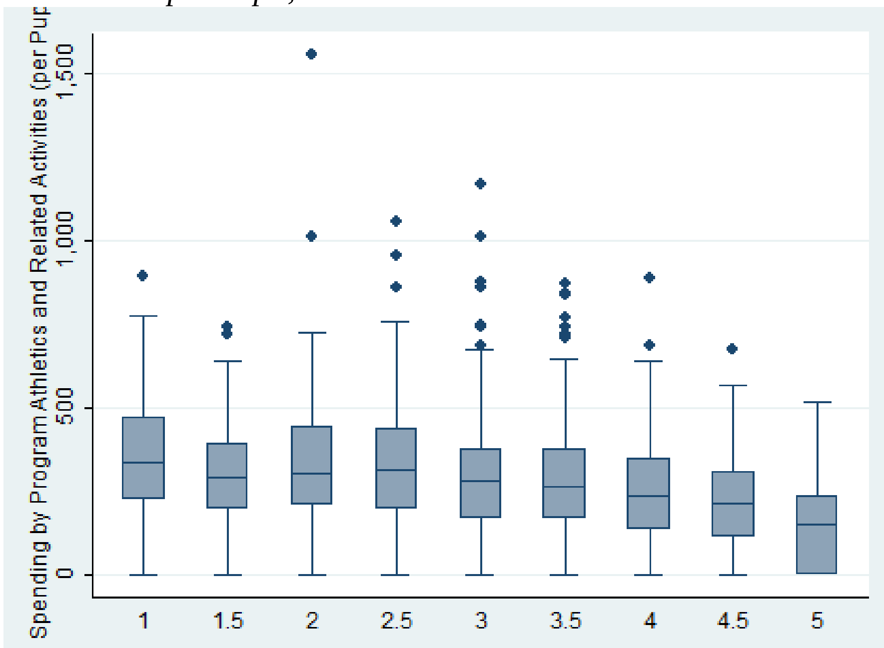
* p < .10, ** p < .05, *** p < .01

The final step in the process was to complete an ordered logistic regression on the data. Like 2008-09, athletic spending per pupil had a negative coefficient, meaning that as athletic spending went down, FAST rating increased. The size of a district continued to display a positive, statistically significant impact on FAST rating ($p < .01$) while the percent of students who were economically disadvantaged continued to show a negative effect on efficiency. In addition, the Chi-squared test showed that the probability of having a greater Chi-square test statistic was 0.00. See **Table 88**.

2010-2011 Data Analyses

The final year of data presented 1,136 school districts and charter schools that were rated by the FAST. In that year, districts and charter schools spent an average of $283 per pupil on athletics, with 107 school districts and charter schools expending $0 on athletics. A box and whisker plot was completed to ascertain the existence of outliers, and it was calculated that school districts and charter schools expending more than $1,219 per pupil would be considered outliers as it was more than 5 standard deviations above the mean. A total of one outliers was removed. See **Figure 26**.

Figure 26:
Extracurricular Costs per Pupil, 2010-2011



Once the data set was created, the data were sorted into the 9 categories of the FAST and the measures of central tendency were measured. The findings from 2010-11 were similar to the findings of 2009-10. 1-star districts continued to be the highest

Table 89:
Extracurricular Costs per Pupil by FAST Rating, 2010-2011

FAST Rating	# Obs	Mean	Standard Deviation	Min.	Max
All	1,136	$283	187.0984	$0	$1,558
1-star	35	$365	200.5151	$0	$893
1.5-star	95	$301	160.1627	$0	$740
2-star	135	$314	180.2672	$0	$1,013
2.5-star	190	$325	196.9711	$0	$1,058
3-star	229	$284	186.5909	$0	$1,168
3.5-star	166	$281	184.0307	$0	$870
4-star	143	$246	168.7717	$0	$887
4.5-star	97	$215	146.9274	$0	$672
5-star	45	$157	143.2572	$0	$516

Table 90:
Regression of Extracurricular Costs per Pupil by FAST Rating, 2010-2011

FAST Rating	Coefficient	Standard Error
1-star	365.1714***	30.22871
1.5-star	-63.5188*	35.36141
2-star	-51.48995	33.92167
2.5-star	-40.33985	32.89532
3-star	-80.57754**	32.45667
3.5-star	-84.27986**	33.26317
4-star	-119.5141***	33.72575
4.5-star	-149.8725***	35.26312
5-star	-208.6603***	40.30495

* p < .10, ** p < .05, *** p < .01

spending of all the FAST ratings at $365 per pupil. However, the data showed spending levels varied between the 1.5- and 2.5-star districts with the lower-rated 1.5-star districts spending less per pupil than both the 2- and 2.5-star districts. As has been seen in the prior two years, once FAST rating reached 3-star and higher spending per pupil decreased with each of the categories. For the third straight year, 5-star districts spent the least on athletics per pupil. Once again, 5-star districts spent less than half per pupil than 1-star districts. See **Table 89**.

Once the univariate statistics were completed, a regression analysis was done to determine the statistical significance of the spending levels. Much more similar to the findings of 2008-09, there was a statistically significant difference found in 7 of the 9 categories. Statistically significant differences were found in 1.5- districts at the p < .10 level, while 4- to 5-star districts all had statistically significant differences in at the p < .01 level. These findings suggested, like the findings in 2008-09 and 2009-10, that districts which spend less on athletics are more efficient than districts which spend more. See **Table 90**.

Table 91:
Ordered Logit Model of Extracurricular Costs per Pupil and District FAST Rating, 2010-2011

	Coefficient	Standard Error	Robust Standard Error
Athletic Spending per Pupil	-.2088355***	.031403	.0352664
Total Enrollment Count	.1537135***	.0353386	.0363703
Percent Eco. Disadvantaged	-.0304775***	.0028233	.0029646

* p < .10, ** p < .05, *** p < .01

The final step in the process was to conduct an ordered logit of the data to determine if the spending patterns had a significant effect on the FAST rating. Results from 2010-11 were similar to those of the two prior years. Statistical significant relationships were present in each of the three independent variables tested. Athletic spending per pupil had a statistically significant ($p < .01$) negative coefficient, signifying that as spending per pupil decreased the FAST rating increased. As with prior years, the ordered logit revealed the total enrollment count was positive while the percent of students who were economically disadvantaged decreased. Finally, the Chi-squared test indicated that the probability of having a greater Chi-square test statistic was 0.00. See **Table 91**.

Multiyear FAST Data Analyses

Once the analyses of the three individual years were completed, the data were pooled into one large data set to determine if the findings from the singular year snapshots held true over the three years of the data. The ordered logistic regression of the pooled data showed, as was seen in each individual year, there existed a negative, statistically significant relationship between athletic spending per pupil and FAST

Table 92:
Ordered Logit Model of Extracurricular Costs per Pupil and District FAST Rating, 2008-2011

	Coefficient	Standard Error	Robust Standard Error
Athletic Spending per Pupil	-.1950315***	.0182138	.020451
Total Enrollment Count	.2035098***	.0205392	.0211142
Percent Eco. Disadvantaged	-.0279709***	.001617	.0017123
School Year 2	.086524	.0739604	.0741465
School Year 3	.1051097	.0738734	.0733598

* p < .10, ** p < .05, *** p < .01

efficiency. As was also seen in each of the three year snapshots, the total enrollment of a district had a positive correlation with efficiency, while the percent of students who were economically disadvantaged was negatively related to efficiency. Finally, as was the case in each of the three individual years of analysis, the Chi-squared test showed that the probability of having a greater Chi-squared test was 0.00. This finding allows one to reject the hypothesis that Extracurricular Costs are irrelevant to a school district or charter school's efficiency. See **Table 92**.

The findings for all three years of data showed a consistent pattern that a decrease in athletic spending would increase efficiency as measured by the FAST. As noted earlier in this section, research has shown a positive relationship between athletic participation and student achievement. However, it was important to remember that research by Lipscomb (2007) noted that only a 1% - 2% gain resulted from participation in athletics. It was quite possible that the minimal gains achieved by students who participated in athletics were not worth the costs—at least in terms of the efficiency of a school district or charter school—of the athletic expenditures.

Summary of Findings

The findings of this research present both a challenge and an opportunity for administrators and policymakers wishing to increase efficiency in Texas public schools. Overall, districts and charter schools which spend less money were found to be more efficient than their peers. Districts should consider cost saving measures, such as increasing class size and hiring less experienced teachers with lower salaries, as ways to increase efficiency. Spending less on athletics while increasing expenditures in Bilingual/ESL programs were also found as ways to increase efficiency. Property wealthy districts were found to be less efficient; therefore policymakers must find ways to ensure that property wealthy districts do not spend money inefficiently. Finally, the most consistent findings of this study were that larger districts do operate in a more efficient manner than do smaller districts and that the number of students who were economically disadvantaged was the strongest predictor of efficiency throughout each of the variables analyzed. Steps must be taken to ensure that smaller districts and districts with high numbers of economically disadvantaged students are using the most effective techniques to increase the achievement of students. See **Table 93**.

Table 93:
Summary of the Findings

Variable	Findings
Expenditures by Function	• Efficient districts expend less per pupil overall • 9 of 15 functions were found to be negatively correlated with efficiency
Expenditures by Program	• Efficient districts expend less per pupil overall • 5 of 8 programs were found to be negatively correlated with efficiency • Bilingual/ESL was the only program found to be positively correlated with efficiency
District Size	• Total enrollment was positively correlated with efficiency • Ethnic make-up of students was not a factor in efficiency
Property Wealth	• Wealthier districts were found to be less efficient • The percent of revenue from Federal funds was found to be negatively correlated with efficiency • The Interest and Sinking tax rate of a district was found to be positively correlated with efficiency
Administrative Costs	• Efficient districts expend less per pupil overall • The average salary of campus administrators was positively correlated with efficiency • The average salary of central office administrators was negatively correlated with efficiency • The percent of campus administrators was positively correlated with efficiency • The percent of central office administrators was negatively correlated with efficiency
Student/Teacher Ratio	• Efficient districts have a higher student/teacher ratio
Teacher Experience	• Efficient districts have teachers with lower average years of experience • Teacher turnover was found to be negatively correlated with efficiency
Athletic/Cocurricular Costs	• Efficient districts spend less per pupil on athletics

CHAPTER V

SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Introduction

The findings of this study are summarized in this chapter. To begin, a summary of the findings from each of the 8 variables are given discussing the significance of each of the findings and how it relates to prior research. Following the summary, a discussion of the conclusions which can be drawn is provided. At the end of Chapter 5, there is an overview of implications to practice and recommendations on how to use the information in this record of study to improve overall efficiency in schools, as well as final conclusions.

Summary of Research

This study began as an attempt to identify spending patterns within districts which might serve as predictors for efficiency. Using the Financial Allocation Study of Texas (FAST) as the lens through which efficiency is measured, FAST data from 2008-2009, 2009-2010, and 2010-2011 were analyzed to help identify the spending patterns which either help or hinder a district's efficiency. The summary of those findings are presented below.

Expenditures by Function as a Predictor of Efficiency

The first area of analysis for this study was to explore operating expenditures by function, specifically which functions may be positively or negatively correlated with efficiency, to ascertain where efficient school districts and charter schools spend their money. The results of the analysis showed more efficient districts and charter schools do, in fact, spend less on total operating expenditures per pupil than do less efficient districts. The results also indicated a negative, statistically significant relationship between 8 of the 15 functions and efficiency. More efficient districts spend less in the areas of Instructional Expenditures, Instructional Related Expenditures, Instructional Leadership, Support Services, Cocurricular Expenditures, Plant Maintenance and Operations, Data Processing, Community Service Expenditures, and Capital Outlay Expenditures. The finding that expenditures in instruction are negative statistically significant factors in FAST rating supports the work of Hanushek (1996) and others which has argued that more resources in schools do not systematically improve student performance. This finding is evidence against the 65% mandated directed to Texas school districts by Governor Perry in 2005 and confirms its subsequent repeal.

However, there were areas which did not have a predictive value on overall efficiency. Spending in the areas of School Leadership, Transportation, Food Services, Central Administrative Costs, Security, and Debt Services were not found to be statistically significant to FAST rating. The finding that school leadership, i.e. the costs associated with campus level administrators and central administrative costs, were not statistically significant runs contrary to the widely held belief that school districts and charter schools are overly bureaucratic and that administrators utilize too great a share of educational costs. It is also supportive of the work of Brewer (1996) which showed inconsistent support for the contention that administrative resources are detrimental to educational productivity. While some may be surprised to see no correlation between debt service spending and FAST rating, this finding might support the findings of Schneider (2002) who posited that good lighting, cleaner air, and a well-designed school have a positive correlation with student achievement; therefore, the additional costs associated with the construction of school buildings may be more efficient in the long run.

Finally, as was seen throughout the study, there was a negative correlation between the number of students who were economically disadvantaged and the FAST rating and a positive correlation between district size and efficiency. This finding is supportive of the work of Ray (1991) and Condron and Roscigno (2003) who found that the socio-economic status of students is negatively correlated with efficiency. The finding may also be supportive of the work of Duncombe and Yinger (2001) which found that consolidation of schools with less than 300 pupil may result in a 20% reduction of costs and a 7%-9% reduction in costs for districts with up to 900 students.

Program Expenditures as a Predictor of Efficiency

A specific analysis into instructional expenditures by program was conducted to determine if certain educational programs lead to greater educational efficiency in school districts and charter schools. The total operational expenditures by program were analyzed, as was each instructional program reported by districts to the state: Regular Education program expenditures, Special Education expenditures, Accelerated Instruction expenditures, Gifted and Talented expenditures, Career and Technology expenditures, Bilingual/ESL program expenditures, Athletic expenditures, and Other program expenditures. The analyses showed that there was negative, statistically significant relationship between total operating expenditures by program and FAST rating, again, signifying that more efficient districts and charter schools spend less money per student on programmatic expenditures than do less efficient districts and charter schools. This finding also held true when looking at spending in Regular Education, Special Education, Accelerated Instruction, Gifted and Talented, and Other program expenditures. These findings do support the belief that students in special programs, i.e. special education, are more expensive to educate than peers (Chaikind, Danielson, & Brauen, 1993).

However, unlike expenditures by function which was unable to discover a single function which was positively correlated to efficiency, when looking at spending by program the analyses revealed that spending in the area of Bilingual/ESL was positively associated with efficiency. This finding may surprise many who believe that bilingual education is a waste of tax payer dollars and that English immersion is the best route to student success, but does support of the work of Greene (1998) who found that bilingual education are effective at increasing student achievement on standardized tests.

Finally, overall district size proved once again to be positively related to school district rating, while the percent of students who are economically disadvantaged is once again a negative predictor of efficiency.

District Size as a Predictor of Efficiency

After exploring the total operating costs and the spending by program of school districts and charter schools, the analysis of the size of a district and efficiency shows that district size does have an effect on overall FAST rating. All three years of data show that larger districts are more efficient than smaller districts. In fact, each year is found to have a significance at the $p < .01$ level. When considering the ethnic make-up of students, the findings suggests that no matter the ethnic group, an increase in the number of students enrolled is positively correlated to efficiency. As such, an influx of Hispanic or African American students to a districts will have a positive impact on efficiency in a similar manner that an influx of White or Asian/Pacific Islander students would have on a district or charter school. As was seen in all areas of the study, the number of students who were economically disadvantaged continued to show a strong ($p < .01$) negative statistically significant relationship with FAST rating.

These findings are contrary to the findings of Driscoll, Halcoussis, and Svorny (2003) who found that reducing both school and class size improves overall education achievement. The findings also contradict the work of Howley (1996) which revealed that smaller schools and districts facilitate the achievement of impoverished students, though Howley does show that larger schools and districts facilitate the achievement of more affluent students. A study by Walberg and Fowler (1987) indicated that students in smaller districts generally achieved more than those in larger districts. Although it is important to note that effective does not necessarily mean the same as efficient, FAST data demonstrated that larger districts, as a whole, are more efficient than smaller districts.

Property Wealth per Pupil as a Predictor of Efficiency

When analyzing the property wealth per pupil as a predictor for financial efficiency, the results show a consistent pattern for all three years of FAST data. To begin, property value per pupil is negatively correlated with efficiency in all three years of the study. A second finding in this area is that districts with a higher percentage of Federal revenue are negatively correlated with rating. The finding that Federal funds have a negative correlation with efficiency is not surprising because Federal funds are generally based on the number of students on free and reduced lunch. Since students on free and reduced lunch have a tendency to score lower on achievement tests (Ray, 1991; Condron and Roscigno, 2003), one could argue that it is logical to see that districts which have a higher portion of their budget from Federal funds achieve less and are therefore less efficient. However, it since FAST ratings are based on a value-added model where achievement is based on a student's growth, inefficiencies seen schools with higher numbers of economically disadvantaged students cannot be solely related to the achievement tests alone. It is possible that districts with high numbers of economically disadvantaged students are unable to attract and retain highly effective teachers and principals, thereby resulting in less efficient districts.

It was also seen that districts which have a higher Interest and Sinking (I&S) tax rate—the tax rate which is used to pay for school construction—score higher in FAST rating than do districts which do not have a higher I&S rate. Though this finding does not necessarily confirm the finding that Debt Service expenditures are not statistically significant predictors of FAST rating (See **Expenditures by Function as a Predictor of Efficiency**), this does seem to support that expenditures on school construction are not detrimental to efficiency. The final finding of this area is that the size of a district is positively correlated with FAST rating, meaning that larger districts are more efficient than smaller districts, and that the percent of students who were economically disadvantaged is negatively correlated with efficiency.

These findings support the work of Rolle, Torres, and Eason (2012) that found that the local property value per students is the strongest predictor of expenditures per student; therefore, it is logical to assume that districts with greater assessed property value spend more money on their students than property poor districts. However, spending more money does not necessarily translate to efficiency as measured by the FAST. The fact that property wealthy districts are less efficient than poorer districts contradicts the work of Houck, Rolle, and He (2010) which found that efficient districts in Georgia have higher wealth than their peers.

Administrative Costs per Pupil as a Predictor of Efficiency

Despite the fact that administrative spending proved to have no statistical significance when compared to other functions of spending overall, it is such a widely held belief that districts waste money by hiring unnecessary administrators that it was decided to analyze this specific area of spending by school districts and charter schools separately. Perhaps not surprisingly to critics, districts which spend less per pupil on administrative costs prove to be more efficient than those which spend more when analyzing administrative costs alone. This finding is seen in all three years of analysis. However, the analysis did show that the percent of administrators in both central administration and at the campus level has a positive correlation with efficiency, as well as having a positive correlation between administrator salary and efficiency in each of the three years. While these findings seem to contradict themselves, the results might be explained by the positive relationship between district size and efficiency. Larger districts tend to have more administrators, and those administrators tend to be paid more than administrators in similar positions in smaller districts; therefore, it can be inferred that the relationship between increased salary and increased percent of administrators is a nonlinear relationship between size and rating. Once again, the percent of students who are economically disadvantaged serves a negative predictor of efficiency.

As mentioned, the finding that administrative costs are negatively associated with efficiency is supportive of the widely held belief by politicians and others that schools waste money when they spend on administration. Research by the likes of Walters (2005) and others have found that lower administrative costs increase efficiency. These findings support that argument.

Student/Teacher Ratio as a Predictor of Efficiency

While multiple studies (Cho, Glewee, & Whilter, 2012; Hoxby, 2000; Jepsen & Rivkin, 2009) have found a positive effect between student/teacher ratio and student achievement, others (Hanushek, 1996) have less confidence in this belief due to a lack of consistent statistical support. Either way, few studies have been conducted to see whether the supposed gains from a small student/teacher ratio leads to greater efficiency. When using the FAST as a measure for efficiency, it was found that larger student/teacher ratios produce greater efficiency in all three years of analysis. This finding can lead one to assume that, though there may be gains in achievement, those gains are not worth the additional costs of hiring more teachers to reduce class size. As with each of the factors analyzed thus far, the analysis of student/teacher ratio did conclude that there is a negative correlation between students who are economically disadvantaged and FAST rating. However, this variable was the only factor which produced a negative correlation between district size and efficiency of all the variables produced. This finding can possibly be the result of the fact that smaller schools, which may have a smaller number of students, might more often receive waivers from the Texas Education Agency (TEA) to allow their classes to extend beyond the 22 to 1 mandated ratio in K thru 4th grade while larger districts are more able to meet the mandate.

As noted, this finding does not necessarily refute the findings of those who have found that reduced student/teacher ratio produces higher results (Cho, Glewee, & Whilter, 2012; Hoxby, 2000; Jepsen & Rivkin, 2009). However, it does seem to confirm the findings of Hanushek (1996) that smaller class size does not consistently lead to better achievement by students. Though smaller student/teacher ratios may produce higher achievement, this research shows that smaller class sizes are less efficient.

Teacher Experience as a Predictor of Efficiency

The results of the analyses of teacher experience as a predictor of efficiency showed that teacher experience is negatively associated with efficiency, meaning that districts with more experienced teachers are not as efficient as those with less experienced teachers. Again, this finding does not suggest that experienced teachers do not produce better results. Research by Harris and Sass (2011) and Kukla-Acevedo (2009) argues that teachers with more experience produce greater achievement in students than less experienced teachers; however, the gains made in achievement may not be worth the additional costs of having a more experienced staff. Teacher turnover rate was found to be negatively associated with efficiency and supports the work of Ronfeldt, Loeb and Wyckoff (2011) which noted the disruptive effect of teacher turnover on achievement. The findings that district size is positively associated with efficiency and that the percent of students who are economically disadvantaged is negatively associated with efficiency are the same as has been found in previous variables studied.

Cocurricular Expenditures per Pupil as a Predictor of Efficiency

The results of the FAST data analyses show that athletic expenditures per pupil have a negative correlation to efficiency in schools. This finding supports the previous assertions in both **Expenditures by Function** and the **Program Expenditures** section of this study. The research by Fejgin (1994), Broh (2002), and Lumpkin and Favor (2012) has shown that athletic participation has a positive effect on student grades and achievement. These findings support the assertion that, while athletic expenditures may increase student achievement, it may not be the most efficient use of funds. This area of analysis again found that district size is positively associated with efficiency while the economic status of students is negatively associated.

Discussion

The study of school efficiency is daunting. There is fierce debate amongst scholars, educators, policy-makers, politicians, and the public in general as to what it means to have an efficient school system. The methodology used varies by researcher. The inputs and outputs vary by study. The existing research on efficiency concentrates mainly on what it means to be efficient based on a framework created by the researcher, which may or may not be accepted by his or her peers and is often not even read by practicing administrators.

The Financial Allocation Study of Texas (FAST) is unique in that it is the first—at least to this researcher's knowledge—framework which is sanctioned by a state to calculate the efficiency of every school district, campus, and charter school within a state. It is a framework that is used by practicing educators. It is reported on by local newspapers and news stations. It is looked to as the definition of efficiency in the state of Texas. Therefore, a study of the FAST and how efficiency is measured through its lens provides meaningful insight to those wishing to gain a better understanding of efficiency in Texas.

The first and most glaring revelation when studying the FAST is simply that efficient districts spend less overall. While this may not completely answer the question as to whether or not money matters in schools, it does provide evidence and context that seems to support the arguments of Hanushek and others who contend that additional spending by schools does not necessarily lead to greater achievement. The FAST, which has attempted to control for many of the variables which continue to be major points of contention for researchers,—including district size, geography, student demographics, and different economic contexts of districts—seems to confirm the widely held belief that schools spend money in ways that do not lead to greater achievement.

However, it is important to note that while schools which spend more per pupil are not as efficient as schools which spend less, it does not necessarily mean that school districts and charter schools are "wasting" money. Schools may choose to spend money on curricular programs such as Advanced Placement or having additional foreign language courses which may not have a direct effect on state assessment scores. The money and the spending might be of great value to the school and the students, but that value might not be able to be quantified by student achievement. This might lead one to assume that a district or charter school is being wasteful when, in fact, the district or charter schools is simply placing a priority on things which do not increase measured achievement.

Another significant finding of this study is that the most predictive variable for efficiency in Texas is the socio-economic status of students. The percent of students who were economically disadvantaged was found to be negatively correlated to efficiency in all 8 variables analyzed in this research. Districts and charter schools with high levels of students in poverty are less efficient than are districts with fewer economically disadvantaged students. For example, 69% of students in 1-star districts are economically disadvantaged compared to only 48% of students in 5-star districts. This trend is seen across all FAST ratings and throughout this study.

Districts with high numbers of students in poverty face a number of challenges that are not present in districts with more affluent districts. The social, familial, and environmental barriers faced by students in poverty (Morgan Consoli et. al., 2013; Williams & Sánchez, 2013) often inhibit the achievement of students in poverty making it more expensive for districts and charter schools to generate the necessary achievement. While the FAST attempts to control for poverty, the results of the study show that the economic status is the greatest predictor of efficiency.

The other most consistent finding of the study is that larger districts are more efficient than smaller districts. Due to the geographic size of Texas and the distribution of the populace, as well as the strongly held belief in local control, it is easy to see why the more than 1,000 school districts were created. Despite the consolidation of schools which has been occurring throughout Texas—and the nation—over the last 100 years, over 30% (320 total) of school districts in Texas continue to have an enrollment of less than 500 students, with an additional 20% (205 total) with an enrollment of less than 1,000 students. These small school districts, though important to many of the town and communities throughout the state, are not found to be efficient as larger districts. Though researchers (Duncmbe et. al., 1995, 1996; Reschovsky & Imazeki, 1997; Andrews, Duncombe, & Yinger, 2002) have found that a U-shaped curve exists in efficiency and that as districts grow beyond 2,000 students they lose some their efficiency, there appears to be a great number of districts whose efficiency could increase if consolidated with other districts. What remains to be seen is whether politicians have the political will make such a move.

Spending patterns, which was the original impetus for this record of study, allow for limited conclusions in that the results showed that more efficient districts spend less per pupil than do less efficient districts in almost all areas. Spending on instruction and instructional related services is less in more efficient districts and charter schools. Spending in instructional leadership, cocurricular/athletics, administrative costs, plant maintenance, and other functions and programs are also less in efficient districts and charter schools when compared to their less efficient peers. In order to become more efficient, school districts and charter schools must learn how to spend less and become more effective in these areas if they wish to increase efficiency. In fact, the only program which was found to be positively correlated with FAST rating was spending in the area of Bilingual/ESL education. Bilingual/ESL programs in Texas appear to be an effective use of funds, and the findings in this study would argue for an increased investment in bilingual education and possibly expanding such programs to include more students who might have limited language skills.

Another area of interest in this record of study was to discover whether the property wealth of a district had an effect on efficiency. Property wealthy districts were found to be less efficient than less wealthy districts. Despite efforts to increase equity, i.e. Robin Hood, the fact that property value is the number one driver of the school funding mechanism in the state of Texas means that wealthier districts receive greater funding than do less wealthy districts. It does appear that wealthy districts use these additional funds inefficiently and it can be concluded that further efforts to increase the equity amongst school district should continue.

The final aspects of the study involved researching the effects of teacher experience and classroom size as predictors of efficiency. The results show that having a higher student/teacher ratio leads to greater efficiency, while districts with more experienced teachers are not as efficient as those with less overall efficiency. These findings are not surprising due to the fact that payroll and salary costs are the greatest portion of a school's budget. The need to hire more teachers to reduce the student/teacher ratio increases the payroll cost of a district and leads to lower efficiency. For example, having to hire 4 teachers to teach 78 students in a grade (19.5:1 student/teacher ration) is obviously more expensive than only having 3 teachers (26:1 ratio). The additional payroll costs of hiring an additional teacher was found to be inefficient. The same could be said with teacher experience due to the fact that teacher salary in Texas is directly related to the number of years experience of a teacher. Employing a teacher with 5-years experience versus a teacher with 15-years experience could mean a salary difference of $8,000-$10,000 for that position. Factoring that across an entire campus or district staff could create a significant difference in the overall payroll for the district. Therefore, it is not surprising to see that districts which save on payroll, either through a having a greater student/teacher ratio or a less experienced staff, would lead to less payroll costs and an increased level of efficiency.

Implications for Policy

Policymakers have the difficult responsibility of determining and prioritizing where limited tax payer funds are spent. This decision is especially difficult when determining the allocation of educational funds due to the fact that educational outcomes may not be fully realized until years later. According to Brimley, Verstegen, and Garfield (2012):

> It is normal for people, and especially overburdened taxpayers, to compare costs and apparent productivity of various institutions or industries – particularly those in direct competition with each other for scarce tax

dollars. Such comparisons may reflect unfavorably on education for reasons beyond the control of those involved. (p. 13)

It is therefore important for policy-makers to have an understanding of the FAST and how Texas measures efficiency in order to have as much information as possible when making those decisions.

To begin, efforts should be made to further explore how and why the socioeconomic status of students is the most consistent predictor of FAST efficiency. The first and most glaring conclusion that can be drawn from this study is that school districts and charter schools with high numbers of economically disadvantaged students are less efficient. Such a finding could lead policymakers to begin to question the efficiency rating process. Are their flaws in the design of the FAST which fail to adequately account for socioeconomic status in students? Are their flaws in the accountability measures which unfairly inhibit adequate achievement on the standardized tests which represent the outcome in the FAST? Is it correct to expect efficiency from all school districts and charter schools or is there a level of inefficiency which policymakers are able to accept and defend due to the variety of factors which are beyond the control of educators? Without further discussions and consensus about these and other FAST related questions, it may be impossible for policymakers to make informed decisions regarding the findings of this study and FAST in general.

Another implication for policymakers is that the size of a district is related to efficiency and that larger districts tend to be more efficient than do smaller districts. The possible consolidation of districts has been tried before in response to school finance lawsuits and failed miserably at the ballot box (Walsh, Kimerer, & Maniotis, 2005), so there may be little incentive for policymakers to take steps to consolidate districts. However, the fact remains that FAST data show that larger districts do perform more efficiently than do smaller districts and, if greater efficiency is the goal of policymakers, then efforts to consolidate small districts—especially inefficient small districts—should be made.

Policymakers must also consider the implications of maintaining a class-size restriction on K-4 classes. Findings in this report indicate that larger class sizes are more efficient than smaller classes. Therefore, policymakers who desire efficiency in public education should also consider increasing the student/teacher ratio above the 22:1 mandate which is current law in Texas. Small class size is a selling point for many school districts and, like consolidation, will likely receive a great deal of resistance from parents and educators, but as policymakers trying to stretch a limited budget, increasing the student/teacher ratio may be the quickest way to increase the efficiency of schools because it requires a smaller initial investment than other possible options.

The finding that the interest and sinking rate of districts was positively correlated with efficiency should encourage policymakers to find ways to encourage the construction of buildings rather than increasing capital outlay expenses. Funding for Existing Debt Allotment (EDA) and Instructional Facilities Allotment, which are both designed to help property poor districts pay for school construction and have been cut in recent budget cycles, should be reintroduced as a way to help school districts fund new construction. New buildings provide a sense of pride in the community, in educators, and in students; the results suggest that expenditures in these areas are worth the additional costs that come with the repayment of bonds.

Implications for Practicing Administrators

As a practicing administrator, the knowledge that the percent of students who are economically disadvantaged provides the greatest predictor of financial efficiency is important. Practicing administrators should use this knowledge to find inexpensive ways to better reach these students in order to increase achievement. Make it a goal of the district or campus to focus on these students by providing training to teachers through in-service which is designed and focused on helping this population of students. There are efficient districts which have high levels of economically disadvantaged students, so administrators should make efforts to seek out these districts and learn how successful districts are able to increase achievement for these students. Practicing administrators should attempt to establish relationships with the parents of these students in an effort to increase parent support for these students. By creating policy and practices which are aimed specifically at increasing achievement in students who are economically disadvantaged, district leaders will go a long way in improving the overall efficiency of a district.

The finding that both teacher experience and teacher turnover have a negative impact on efficiency has implications for practicing administrators and should impact both the hiring and retention efforts of districts. Districts which have a desire to be more efficient should find ways—preferably inexpensive ways—to retain teachers. Research by Jensen (1987) finds that by providing meaningful work, developing professional working conditions, and giving opportunities for growth are all effective in retaining good teachers. Therefore, practicing district leaders should make efforts to create these conditions within their districts as a way to retain their teachers.

However, there is always going to be a need to hire new teachers. The results of this study indicate that less experienced teachers are more efficient, so district leaders should not be afraid to hire less experienced teachers who are able to fill positions at a lower cost. Once hired, the practicing administrators should help these teachers as they learn how to best teach their students. Creating strong teacher induction programs and meeting the needs of new teachers are ways to increase the competency of less experienced teachers as they begin their careers. Developing strong mentoring programs, which help less experienced teachers learn and grow as teachers, is likely to be more cost-effective in the long run than hiring more experienced teachers that have a higher salary. By viewing new teachers as assets which are able to bring new ideas and practices into existing school climates, practicing administrators will be able to encourage the growth of these less experienced teachers and increase the efficiency of a school district.

The finding that bilingual/ESL programs are an efficient use of district funds should encourage practicing administrators to increase the effective use of these programs. If there is a question as to whether a student should be included in a bilingual/ESL program, district leaders should err on the side of placing these students in the bilingual/ESL program rather than in the regular education setting until leaders are certain that these students will be successful in the mainstream. The goal of a bilingual/ESL program is to increase proficiency in both languages as a means to increase achievement (Christian, 1994), and practicing administrators should embrace this goal as a way to increase efficiency.

Bottom line for administrators is that they must find ways to cut costs in education if districts are to become more efficient. By limiting the expenses in areas such as athletics, plant maintenance and operations, and student support services—just to name a few—a district leader can increase the efficiency of the district. Therefore, efforts should be made to limit the costs associated with these aspects of school.

Recommendations for Further Studies

Overall, the goals and objectives of this study were limited compared to all the information and studies that could be gathered from the Financial Allocation Study of Texas (FAST). Volumes of research could be done using FAST data, and as with most studies, this research generated as many questions as it did answers. There are several aspects of efficiency in Texas which would benefit from further research.

To begin, further research should include an in-depth analysis of the 5-star districts in Texas to better understand their unique characteristics (student demographics, teacher demographics, spending patterns, etc.) and why they are rated as the most efficient school districts in Texas. A better knowledge of 5-star districts would increase the understanding of how and why these districts are efficient and would enable other districts to possibly replicate the spending patterns of these districts. If the goal of educators is to be more efficient, then a greater understanding of efficient districts would help those districts striving to increase their efficiency.

Similarly, an in-depth analysis of the spending patterns and characteristics of 1-star districts and why they are rated as the least efficient school districts in Texas. As with 5-star districts, it is important to look specifically at the least efficient districts as an example of how not to spend money or to make recommendations to those districts as how to better spend their money. For practicing school leaders and policymakers, a knowledge of how 1-star districts spend their money can be an important tool to help make better decisions by helping them avoid spending which is seen to be inefficient.

A third recommendation for future study would be a qualitative analyses—either through case study or some other qualitative means—of school districts and charter schools which are efficient despite high numbers of economically disadvantaged students. The results of this study clearly show that the level of economically disadvantaged students is negatively correlated with efficiency. It is a predictor that is seen across the study and is consistent throughout all years of the FAST. However, there are many districts with high numbers of economically disadvantaged students who have a 5-star rating. Knowledge about the practices of these districts which facilitate success in students who are economically disadvantaged could be invaluable to other districts with high numbers of economically disadvantaged that are striving to become more efficient.

Another recommendation for further study using FAST data is to have an analysis of spending patterns and efficiency at the campus level rather than at the district level. The traditional model of economic analysis of school finance has been focused at the district level and school district capacity (Duncombe, Ruggiero, & Yinger, 1996).

However, as suggested by Berne and Steifel (1994), “the most critical activities [to improve education] are closest to the child—at the school or program level…Analyses at the school level are more likely to yield meaningful variations in these variables and to uncover stronger relationships with inputs” (p. 405). Despite this logic, research which provides economic analysis at the campus level is rare. Inadequate research at the campus level severely limits the ability of researchers to create predictive models of school funding mechanisms. Researchers are left to make broad generalizations about theoretical concepts—such as adequacy, equity, and efficiency—and are unable to determine the causal relationship between budget and assessment results. Therefore, a study at the campus level would aid researchers in their ability to develop specific policy recommendations to policymakers.

The findings in this research were limited to the composite academic output used by the FAST as the measure of academic success. An analysis of specific outputs, i.e. graduation rates or 3rd grade math scores, to determine if spending in specific areas of the budget might lead to greater achievement in selected areas. This might be beneficial to a district which is efficient yet can have improvement in specific areas. For example, it might be valuable for a district which wants to see improvement in SAT scores to know how efficient districts with high achievement in SAT scores spend money. A knowledge of how to efficiently spend money to achieve increases in specific areas can be important for district leaders wishing to make improvements in those areas.

Finally, further research should include an analysis of teacher characteristics alone as a predictor of efficiency. While this study did research teacher experience and teacher student ratio, teacher demographics such as degree earned, race and ethnicity, and professional development were omitted. Teachers are the ones who are in daily contact with students. The teacher, more than anyone else in the school district, has the most direct contact with students and can effect student achievement more than any other educator. Therefore, it would be interesting to know about teacher characteristics and their relationship to efficiency.

Conclusions

Efficiency, though easy to call for or push as a political agenda, is difficult to both define and achieve in public education. The number of internal and external factors which effect a school district's efficiency are innumerable and are in constant flux. As with most doctoral works, this study began with the grand idea of finding the answer to what it is that makes a school district efficient, and as a result, be able to tell other superintendents, principals, and lawmakers exactly where and how to spend money in order to become more efficient. And, as with most doctoral dissertations, the results are far from earth shattering.

Efficient districts spend less; they spend less in almost all areas and programs. Efficient districts have fewer students who are economically disadvantaged. Efficient districts tend to be larger. Efficient districts spend less on payroll costs by having larger student/teacher ratios and less experienced teachers. Efficient districts spend less on athletics. Property wealthy districts do tend to waste money as they are less efficient than poorer districts. These findings are far from surprising for those with even a passing interest in public education.

However, there were a few areas which might surprise the average person. When looking at the budget as a whole, administrative costs are not significantly different between efficient districts and less efficient districts, which suggests that most districts are not overly bloated with administrators. Bilingual/ESL programs are an efficient use of funds in public schools.

As with most hotly debated topics, people can look at the FAST and take from it what they want. If they want to believe that public education is wasteful, there is definitely data which supports that claim. If they are supporters of public education, then the data is there to support that position as well. For practicing educators, it is their responsibility to look at the good, the bad, and the ugly of public education and look at all the facts in order to make the best decisions for students. Money may make the world go ‘round, but the ‘business’ of education is the kids, and in a fiscal environment where resources are limited, it is important to be able to make cost-effective decisions which benefit the most kids.

REFERENCES

Aaronson, D., Barrow, L., & Sander, W. (2007). Teachers and student achievement in the Chicago public high schools. *Journal of Labor Economics*, *25*(1), 95-135.

Alemán, E.A. (2006,). Is robin hood the "prince of thieves" or a pathway to equity?: Applying critical race theory to school finance political discourse. *Education Policy, 20*(2), 113-141.

Alemán, E.A. (2007). Situating Texas school finance policy in a CRT framework: How "substantially equal" yields racial inequality. *Education Administration Quarterly, 43*(5), 525-558.

Andrews, M., Duncombe, W., & Yinger, J. (2002). Revisiting economies of size in American education: Are we any closer to a consensus? *Economics of Education Review, 21,* 245-262.

August, D., & Shanahan, T. (Eds.). (2008). *Developing reading and writing in second-language learners: Lessons from the report of the National Literacy Panel on Language-Minority Children and Youth.* New York: Routledge; Newark, DE: Center for Applied Linguistics and the International Reading Association.

Baker, B. D. (2003). State policy influences on the internal allocation of school district resources: Evidence from the common core of data. *Journal of Education Finance, 29*(1), 1-24.

Baker, B. D. (2012). Revisiting the age-old question: Does money matter in education?. *Albert Shanker Institute.* Retrieved September 25, 2013 from http://www.shankerinstitute.org/images/doesmoneymatter_final.pdf

Ball, G. C., & Goldman, S. (1997). Improving education's productivity: Reexamining the system to get what we need. *Phi Delta Kappan, 79* (3), 228-232.

Bankston, C. L. III, & Zhou, M. (1995). Effects of minority-language literacy on the academic achievement of Vietnamese youths in New Orleans. *Sociology of Education, 68,* 1–17.

Barone, F. J. (1993). The effects of part-time employment on academic performance. *NASSP Bulletin, 77(549)*, 67-73.

Bembry, K., Weerasinghe, D., and Mendro, R. (1997). *Classroom Effectiveness Indices: Statistical Methodology, Post-hoc Analysis, and Practical Applications* presented at the Annual Meeting of AERA, (Chicago, IL., March, 1997).

Berne, R., & Stiefel, L. (1994). Measuring equity at the school level: The finance perspective. *Educational Evaluation and Policy Analysis, 16*(4), 405-421.

Berne, R. & Stiefel, L. (1999). Concepts of school finance equity: 1970 to the present. In. H.F. Ladd, R.A. Chalk. & J.S. Hansen (Eds.). *Equity and adequacy in education finance: Issues and persercpectives* (pp. 11-33). Washington, D.C.: National Academy Press.

Berry, C. (2006). School consolidation and inequality. *Brookings Papers on Education Policy*, (9), 49-75.

Betts, Julian R., Andrew C. Zau and Lorien A. Rice. 2003. Determinants of student achievement: *New evidence from San Diego*. San Diego: Public Policy Institute of California.

Bhatt, R. (2009). The impacts of gifted and talented education. *Andrew Young School of Policy Studies Research Paper Series*, (09-11).

Bialystok, E. (1988). Levels of bilingualism and levels of linguistic awareness. *Developmental Psychology, 24*, 560–567.

Biancarosa, G., Bryk, A. S., & Dexter, E. R. (2010). Assessing the value-added effects of literacy collaborative professional development on student learning. *The Elementary School Journal*, *111*(1), 7-34.

Borman, G.D., & Dowling, M. (2010) Schools and inequality: A multilevel analysis of Coleman's equality of educational opportunity data. *Teachers College Record, 112 (5)*, 1201-1246.

Boyd, D., Grossman, P., Lankford, H., Loeb, S., & Wyckoff, J. (2006). How changes in entry requirements alter the teacher workforce and affect student achievement. *Education Finance and Policy, 1(2)*, 176–216.

Boyd, D., Lankford, H., Loeb, S., Ronfeldt, M., & Wyckoff, J. (2011). The role of teacher quality in retention and hiring: Using applications-to-transfer to uncover preferences of teachers and schools. *Journal of Policy and Management*, 30(1), 88-2011.

Brewer, D. J. (1996). Does more school district administration lower educational productivity? Some evidence on the "administrative blob" in New York public schools. *Economics of Education Review, 15(2)*, 111-124.

Brimley, V., Verstegen, D. A., & Garfield, R. (2012). *Financing Education in a Climate of Change*. New York, NY: Pearson.

Broh, B. A. (2002). Linking extracurricular programming to academic achievement: Who benefits and why? *Sociology of Education*, 69-95.

Bukowski, B. J. (2010). A comparison of academic athletic eligibility in interscholastic sports in American high schools. *The Sport Journal, 13(2).*

Bui, S. A., Craig, S. G., & Imberman, S. A. (2011). *Is gifted education a bright idea? Assessing the impact of gifted and talented programs on achievement* (No. w17089). National Bureau of Economic Research: Cambridge, MA.

Byrk, A. A., & Raudenbush, S. W. (1992). *Hierarchical linear models*. Newbury Park, CA: Sage.

Cahen, L.S., Filby, N., McCutcheon, G., & Kyle, D.W. (1983). *Class size and instruction.* New York: Longman.

Callari, M. (2002). Academics vs. athletics: Eligibility requirements for interscholastic athletic participation. *Interscholastic Athletic Administration, 29(1),* 4-7.

Camp, W. G. (1990). Participation in student activities and achievement: A covariance structural analysis. *Journal of Educational Research, 83,* 272-278.

Campbell, J. R., Hombo, C. M., & Mazzeo, J. (2000). NAEP trends. *National Center for Education Statistics*, *2*(4), 31.

Chaikind, S., Danielson, L. C., & Brauen, M. L. (1993). What do we know about the costs of special education? A selected review. *The Journal of Special Education*, *26*(4), 344-370.

Cho, H., Glewwe, P., & Whitler, M. (2012). Do reductions in class size raise students' test scores? Evidence from population variation in Minnesota's elementary schools. *Economics of Education Review, 31(3),* 77-95.

Christian, D. (1994). *Two-way bilingual education: Students learning through two languages*. Retrieved April 12, 2013 from http://escholarship.org/uc/item/567256ft

Clotfelter, C. T., Ladd, H. F., & Vigdor, J. L. (2007). Teacher credentials and student achievement: Longitudinal analysis with student fixed effects. *Economics of Education Review*, *26*(6), 673-682.

Clune, W.H. (1994). The shift from equity to adequacy in school finance. *Educational Policy 8*(4), 376-394.

Cohen, M., & Besharov, D. J. (2002). *The role of career and technical education: Implications for the federal government.* ERIC Clearinghouse. Retrieved September 25, 2013 from http://www.gpo.gov/fdsys/pkg/ERIC-ED466939/pdf/ERIC-ED466939.pdf

Collier, V. P., & Thomas, W. P. (2004). The astounding effectiveness of dual language education for all. *NABE Journal of Research and Practice, 2,* 1–20.

Corbett, M. (2007). *To participate or not participate: The relationship between school sponsored extracurricular activity participation and student outcomes* (Doctoral dissertation, Rutgers, The State University of New Jersey). Retrieved from ProQuest Dissertations and Theses.

Costrell, R., Hanushek, E., & Loeb, S. (2008). What do cost functions tell us about the cost of an adequate education?. *Peabody Journal of Education, 83(2)*, 198-223..

CSR Research Consortium. (1999). *Class size reduction in California 1996–98: Early findings signal promise and concerns*. Palo Alto, CA: CSR Research Consortium.

Cubberley, E. (1922). *A brief history of education*. Houghton Mifflin.

Cullen, M., Jones, T.B., & Slate, J.R. (2011). Instructional expenditure ration and student achievement: Is 60% a better indicator? *International Journal of Educational Leadership Preparation 6(2)*.

Dai, D. Y. (2013). Excellence at the cost of social justice? Negotiating and balancing priorities in gifted education. *Roeper Review*, *35*(2), 93-101.

Darling-Hammond, L. & Sykes, G. (2003). Wanted: A national teacher supply policy for education: The right way to meet the "Highly Qualified Teacher" challenge. *Education Policy Analysis Archives*, 11(33). Retrieved July 2, 2013 from http://epaa.asu/epaa/v11n33/.

De Jong, E. J. (2002). Effective bilingual education: From theory to academic achievement in a two-way bilingual program. *Bilingual Research Journal, 26(1)*, 65-84.

DeYoung, A. J. (1987). The status of American rural education research: An integrated review and commentary. *Review of Educational Research,* 57,123-148.

Driscoll, D., Halcoussis, D., & Svorny, S. (2003). School district size and student performance. *Economics of Education Review*, *22*(2), 193-201.

Duncombe, W. D., Miner, J., & Ruggiero, J. (1995). Potential cost savings from school district consolidation: A case study of New York. *Economics of Education Review*, *14*, 265–284.

Duncombe, W. D., Ruggiero, J., & Yinger, J. M. (1996). Alternative approaches to measuring the cost of education. In H. F. Ladd, *Holding schools accountable: Performance-based reform in education* (pp. 327–356). Washington, DC: The Brookings Institution.

Duncombe, W., & Yinger, J. (2001). Does school district consolidation cut costs?. *Syracuse University–Maxwell School of Citizenship and Public Affairs Center for Policy Research Working Paper*, (33).

Duncombe, W., & Yinger, J. (2005). Estimating the cost of meeting student performance outcomes adopted by the Kansas State Board of Education. *A study prepared for the Kansas Division of Legislative Post Audit*.

Duncombe, W.D. (2006). Responding to the charge of alchemy: Strategies for evaluation the reliability and validity of costing out research. *Journal of Education Finance,* 32(2), 137-169.

Dunnam, J. (2009). The facts about the stimulus. *Texas Lyceum Journal*, 8-9.

Embry, J. (2009, March 10). Governor indicates he would accept changes if goals can still be met. *Austin American Statesmen.* Retrieved March 24, 2012 from: http://www.statesman.com/news/content/region/legislature/stories/03/10/0310percent.html

Equity Center. (2010). Money does matter! investing in Texas children and our future. Retrieved June 27, 2011 from http://www.dfpe.org/pdf/FINAL_MoneyMatters-101910.pdf

Exec.Order No. RP47. (2005).

Fejgin, N. (1994). Participation in high school competitive sports: A subversion of school mission or contribution to academic goals? *Sociology of Sport Journal*, *11*(3), 211-30.

Ferguson, R. F. (1991). Paying for public education: New evidence on how and why money matters. *Harvard. Journal on Legislation*, *28*, 465.

Figlio, D. N. (1999). Function form and the estimated effects of school resources. *Economics of Education Review, 18(2),* 81-92.

Finn, J.P. & Achilles, C.M. (1999). Tennessee's class size study: Findings, implications and misconceptions. *Educational Evaluation and Policy Analysis, 21,* 97–110.

Finn, J., Gerber, S., Achilles, C., & Boyd-Zaharias, J. (2001). The enduring effects of small classes. *The Teachers College Record*, *103*(2), 145-183.

Fuligni, A. J. (1998). Parental authority, adolescent autonomy, and parent–adolescent relationships: A study of adolescents from Mexican, Chinese, Filipino, and European backgrounds. *Developmental Psychology, 34,* 782–792.

Garber, H. L. (1988). *The Milwaukee Project: Preventing Mental Retardation in Children At Risk.* Published by American Association on Mental Retardation

Golash-Boza, T. (2005). Assessing the advantages of bilingualism for the children of immigrants. *International Migration Review, 39,* 721–753.

Greene, J. P. (1998). *A meta-analysis of the effectiveness of bilingual education*. Tomás Rivera Policy Institute, University of Southern California: Los Angeles, CA.

Gronberg, T. J., Jansen, D. W., Taylor, L. L., & Booker, K. (2004). *School outcomes and school costs: The cost function approach* (Report prepared for the Texas Legislature Joint Committee on Public School Finance, The Texas School Finance Project), Retrieved May 25, 2013 from http://bush.tamu.edu/research/faculty/TXSchoolFinance/papers/SchoolOutcomesAndSchoolCosts.pdf

Gronberg, T.J., Jansen, D.W., Taylor, L.L. (2011). The adequacy of educational cost functions: Lessons from Texas. *The Peabody Journal of Education, 86*(1), 3-27.

Guin, K. (2004). Chronic teacher turnover in urban elementary schools. *Educational Evaluation and Policy Analysis*, 12(42), 1-25.

Haelermans, C., De Witte, K., & Blank, J. L. (2012). On the allocation of resources for secondary schools. *Economics of Education Review*, *31*(5), 575-586.

Han, W. J. (2011). Bilingualism and Academic Achievement. *Child Development, 83(1),* 300-321.

Hanushek, E.A. (1986) Economics of schooling: Production and efficiency in public schools. *Journal of Economic Literature, 24(3),* 1141-1177.

Hanushek, E. A. (1996). School resources and achievement in Maryland. *Baltimore, MD: Maryland State Department of Education*, 417-458.

Hanushek, E. A. (1997) Assessing the effects of school resources on student performance: An update *Educational Evaluation and Policy Analysis. 19(2)*, 141-164.

Hanushek, E.A. (1999). Some findings from an independent investigation of the Tennessee STAR experiment and from other investigations of class size effects. *Educational Evaluation and Policy Analysis, 21,* 143–164Hanushek, E. A., Benson, C. S., Freeman, R. B., Jamison, D. T., Levin, H. M., Maynard, R. A., Murnane, R. J., Rivkin, S. G., Sabot, R. H., Solmon, L. C., Summers, A. A., Welch, F. and Wolfe, B. L. (1994) *Making Schools Work. The* Brookings Institution, Washington, DC.

Hanushek, E.A. (2005). The alchemy of "costing out" an adequate education. Retrieved June 30, 2011, from http://www.hks.harvard.edu/pepg/PDF/events/Adequacy/PEPG-05-28hanushek.pdf

Hanushek, E. A., Kain, J. F., & Rivkin, S. G. (1999). *Do higher salaries buy better teachers?* (No. w7082). National Bureau of Economic Research.

Hanushek, E. A., Kain, J. F., O'Brien, D. M., & Rivkin, S. G. (2005). *The market for teacher quality*. Cambridge, MA: National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w11154.pdf

Hanushek, E. A., & Rivkin, S. G. (2010). *Constrained job matching: Does teacher job search harm disadvantaged urban schools?* (No. w15816). National Bureau of Economic Research.

Harris, D. N., & Sass, T. R. (2011). Teacher training, teacher quality and student achievement. *Journal of Public Economics*, *95*(7), 798-812.

Harris, D. N., & Herrington, C. D. (2006). Accountability, standards, and the growing achievement gap: Lessons from the past half-century. *American Journal of Education, 112(2)*, 209-238.

Harrison, D. (2010, October 18). The deficit Texas didn't see coming. Retrieved from: http://www.stateline.org/live/details/story?contentId=521130

Heistad, D. (1999, April). *Teachers who beat the odds: Value-added reading instruction in Minneapolis 2nd grade*. Paper presented at the Annual American Educational Research Association Conference, Montreal, Canada.

Houck, E. A., Rolle, R. A., & He, J. (2010). Examining school district efficiency in Georgia. *Journal of Education Finance*, *35*(4), 331-357.

Howley, C. (1996). Compounding disadvantage: The effects of school and district size on student achievement in West Virginia. *Journal of Research in Rural Education*, *12*, 25-32.

Hoxby, C. M. (2000). The effects of class size on student achievement: New evidence from population variation. *The Quarterly Journal of Economics*, *115*(4), 1239-1285.

Hoxby, C.M. (2001). All school finance equalizations are not created equal. *The Quarterly Journal of Economics, 116*(4), 1189-1231.

Imazeki, J., & Reschovsky, A. (2004). School finance reform in Texas: A never ending story? In J. Yinger (Ed.) *Helping children left behind: State aid and the pursuit of educational equity* (pp. 251-282). Cambridge, MA: MIT Press.

Imazeki, J., & Reschovsky, A. (2006). The legacy of *Rodriguez*: Three decades of school finance reform in Texas. Paper presented for the symposium: Rethinking *Rodriguez*: Education as a Fundamental Right, Boalt Hall School of Law, University of California, Berkeley.

Imazeki, J. (2006). *Assessing the Costs of K-12 Education in California Public School.* Governor's Committee on Education Excellence. Retrieved September 25, 2013 from http://cepa.stanford.edu/sites/default/files/Imazeki.pdf

Ingersoll, R. (2001). Teacher turnover and teacher shortages: An organizational analysis. *American Educational Research Journal*, 38(3), 499-534.

Jacques, C., & Brorsen, B. W. (2002). Relationship between types of school district expenditures and student performance. *Applied Economics Letters*, *9*(15), 997-1002.

Jansen, P. (1992). High school sports: Making magic: Sports build leaders. *Athletic Business,16(3),* 14.

Jensen, M. C. (1987). *How to Recruit, Select, Induct, & Retain the Very Best Teachers. School Management Digest Series*, Number 32. Publication Sales, ERIC Clearinghouse on Educational Management, University of Oregon, 1787 Agate Street, Eugene, OR 97403.

Jepsen, C., & Rivkin, S. (2009). Class size reduction and student achievement: The potential tradeoff between teacher quality and class size. *Journal of Human Resources*, *44*(1), 223-250.

Kazis, R. (2005). Remaking career and technical education for the 21st century. *What Role for High School Programs.*

Kilrea, T. B. (1998). *A study of the relationship between extracurricular activity participation and the academic achievement of high school students* (Doctoral dissertation, Illinois State University). Retrieved from ProQuest Dissertations and Theses.

Kirjavainen, T. (2009). Essays on the efficiency of schools and student achievement. Helsinki School of Economics: Helsinki, Finland.

Konstantopolous, S., & Borman, G. (2011) Family background and school effects on student achievement: A multilevel analysis of the Coleman data. *Teachers College Record, 113 (1).* 97-132.

Krueger, A. B. (2003). Economic considerations and class size*. *The Economic Journal*, *113*(485), F34-F63.

Levin, H. M. (1997). Raising school productivity: An x-efficiency approach. *Economics of Education Review, 16(3)*, 303-311.

Lewis, A. C. (2008). Washington commentary: Doing more with less, *Phi Delta Kappan, 89(8)*, 547-548.

Lipscomb, S. (2007). Secondary school extracurricular involvement and academic achievement: A fixed effects approach. *Economics of Education Review 26(4)*, 463-472.

Little, J. W. (1990) The persistence of privacy: Autonomy and initiative in teachers's professional relations. *Teachers College Record* 91, 509-536.

Lumpkin, A., & Favor, J. (2012). Comparing the academic performance of high school athletes and non-athletes in Kansas. *Journal of Sport Administration & Supervision 4*(1), 41-62.

Marlow, M. L. (2001). Bureaucracy and student performance in US public schools. *Applied Economics*, *33*(10), 1341-1350.

McCarthy, K. J. (2000). The effects of student activity participation, gender, ethnicity, and socio-economic level on high school student grade point averages and attendance. Retrieved from http://www.eric.ed.gov/PDFS/ED457173.pdf

McGuffey, C. W., & Bown, C. L. (1978). The relationship of school size and rate of school plant utilization to cost variations of maintenance and operation. *American Educational Research Journal,* 15,373-378.

Mendro, R., Webster, W., Bembry, K. and Orsak, T. (1994). *Applications of Hierarchical Linear Modeling in Determining Effective Schools* presented at the Annual Meeting of RMERA: Tempe, AZ.

Miles, K. H. (2010). Making standards work: Putting money where it matters. In K. Ryan and J.M. Cooper (Eds.) *Kaleidoscope: Contemporary and classic readings in education*, *12th Edition.* Belmont, CA: Cengage Learning.

Miller, R. G. (19922). An analysis of expenditure patterns in Texas public school districts before and after the 1984 school finance reform. Ed. D. dissertation. Texas Tech University: Lubbok, TX. Retrieved from http://repositories.tdl.org/ttu-ir/bitstream/handle/2346/15064/31295007118044.pdf?sequence=1

Molnar, A., Smith, P., Zahorik, J., Palmer, A., Halbach, A., et al. (1999). Evaluating the SAGE program: A pilot program in targeted pupil-teacher reduction in Wisconsin. *Educational Evaluation and Policy Analysis, 21,* 165–178.

Morgan Consoli, M. L., Consoli, A. J., León Orozco, G., Gonzales, R. R., & Vera, E. M. (2013). Barriers Experienced by Mexican Immigrants: Implications for Educational Achievement and Mental Health. *Association of Mexican American Educators Journal*, *6*(2), 37-47.

Munoz, M. A., & Chang, F. C. (2007). The elusive relationship between teacher characteristics and student academic growth: A longitudinal multilevel model for change. *Journal of Personnel Evaluation in Education, 20,* 147-164.

National Federation of State High School Associations. (2008). The case for high school activities. Retrieved from http://www.nfhs.org/content.aspx?id=3262

Nelson, E. (1985). *School consolidation.* Washington, D.C.: Office of Educational Research and Improvement. (ERIC Document Reproduction Service No. ED 282 346)

Orsak, T., Mendro, R., Webster, W., Bembry, K. and Weerasinghe, D. (n.d.) *Empirical Difficulties in Using Hierarchical Linear Models for School Rankings*. Retrieved

May 25, 2013, from http://www.dallasisd.org/cms/lib/TX01001475/Centricity/Shared/evalacct/research/articles/Orsak-Empirical-Difficulties-in-Using-Hierarchical-Linear-Models.pdf

Portes, A., & Hao, L. (2002). The price of uniformity: Language, family and personality adjustment in the immigrant second generation. *Ethnic and Racial Studies, 25*, 889–912.

Portes, A., & Hao, L. (2004). The schooling of children of immigrants: Contextual effects on the educational attainment of the second generation. Proceedings of the National Academy of Sciences of the United States of America, 101, 11920–11927.

Portes, A., & Rumbaut, R. G. (2006). *Immigrant America: A portrait*. Berkeley: University of California Press.

Rassouli-Currier, S. (2011). Assessing the efficiency of Oklahoma public schools: a data envelopment analysis. *Southwestern Economic Review*, *34*, 131-144.

Reis, S. M., & Renzulli, J. S. (2010). Is there still a need for gifted education? An examination of current research. *Learning and individual differences*, *20*(4), 308-317.

Renzulli, J. S. (2012). Reexamining the role of gifted education and talent development for the 21st Century: A four-part theoretical approach. *Gifted Child Quarterly, 56*(3), 150-159.

Reschovsky, A., & Imazeki, J. (1997). The development of school finance formulas to guarantee the provision of adequate education to low-income students. In W.J. Fowler, Jr. (Ed.). *Developments in school finance 1997* (pp. 131-156). Washington, DC: U.S. Department of Education. National Center for Education Statistics.

Reschovsky, A. & Imazeki, J. (1999). *Does the school finance system in Texas provide students with an adequate education?* Paper presented at the Annual Meeting of the American Education Finance Association, Seattle, WA, March, 1999.

Rice, J.K. (1999). The impact of class size on instructional strategies and the use of time in high school mathematics and science courses. *Educational Evaluation and Policy Analysis, 21,* 215–229.

Riew, J. (1966). Economies of scale in high school operation. *The Review of Economics and Statistics, 48*, 280-287.

Rivkin, S. G., Hanushek, E. A., & Kain, J. F. (2005). Teachers, schools, and academic achievement. *Econometrica, 73*(2), 417-458.

Robertson, B. L. (2012). *Wealth equalization legislation in Texas and its impact on property wealthy districts' financial health from 1993-1994 through 2002-2003*. (Doctoral dissertation, Texas Tech University). Retrieved September 25, 2013 from http://hdl.handle.net/2346/20353

Rockoff, J. E. (2004). The impact of individual teachers on student achievement: Evidence from panel data. *American Economic Review, 94*(2), 247-252.

Rolle, R.A. (2004a). An empirical discussion of public school districts as budget-maximizing agencies *Journal of Education Finance*, 29(4), 277-298.

Rolle, R.A. (2004b). Out with the old and in with the new: Thoughts on the future of Educational productivity and efficiency." *Peabody Journal of Education*, 79(3), 31-56.

Rolle, A., Torres, M., & Eason, N. (2012). Los Elefantes Rosas en las Cúpulas en la Legislatura: An empirical analysis of the Texas education finance mechanism with special emphasis on bilingual education. *Association of Mexican American Educators Journal*, *4*(1), 29-38.

Ronfeldt, M., Lankford, H., Loeb, S., & Wyckoff, J. (2011). *How teacher turnover harms student achievement* (No. w17176). National Bureau of Economic Research.

Roper, D. M. (1996). *Alabama public school expenditures as correlates of student academic achievement.* Ed.D. dissertation, The University of Alabama, AL: U.S. Retrieved from ProQuest Digital Dissertations database. (Publication No. AAT 9633936)

Ross, J. A. (1992). Teacher efficacy and the effects of coaching on student achievement. *Canadian Journal of Education, 17(1),* 51-65.

Ruggiero, J. A. (1996). Efficiency of educational production: An analysis of New York school districts. *The Review of Economics and Statistics, 78(3),* 499-509.

Ruggiero, M. J. (2012). *Effects of Gifted and Talented Programs on Standardized Test Scores of Fourth Grade Students in Two School Districts* (Doctoral dissertation, State University of New York).

Rumbaut, R. G. (1995). The new Californians: Comparative research findings on the educational progress of immigrant children. In R. G. Rumbaut & W. A. Cornelius (Eds.), *California's immigrant children: Theory, research, and implications for educational policy* (pp. 17–69). La Jolla, CA: Center for U.S.-Mexican Studies, University of California, San Diego.

Russ, S., Chiang, B., Rylance, B. J., & Bongers, J. (2001). Caseload in special education: An integration of research findings. *Exceptional Children, 67(2),* 161-172.

Sabulao, C. M., & Hickrod, G. A. (1970). *Optimum size of school districts relative to selected costs.* New York, NY: American Educational Research Association. (ERIC Document Reproduction Service No. 047377)

Sanborn, J. (2002). Targeted training. *School Administrator, 59(11),* 16–19.

Scharrer, G. (2009, February 24). *Lawmakers take aim at 22:1 school standard*. Retrieved February 6, 2013 from http://blog.chron.com/texaspolitics/2009/02/lawmakers-take-aim-at-22-1-school-standard/

Schneider, M. (2002). *Do school facilities affect academic outcome?* National Clearinghouse for Educational Facilities. Washington, DC.

School district organization in Illinois. (1985). Springfield, IL: Illinois State Board of Education.

Schwartz, A.E., & Stiefel, L. (2001). Measuring school efficiency: Lessons from economics, implications for practice. In D.H. Monk, H.J. Walberg, & M.C. Wang (Eds.) *Improving Educational Productivity*, 115-138.

Silverberg, M., Warner, E., Goodwin, D., & Fong, M. (2002). *National Assessment of Vocational Education: Interim Report to Congress.* Retrieved September 25, 2013 from http://www2.ed.gov/rschstat/eval/sectech/nave/interimreport.pdf

Smith, M.L. & Glass, G.V. (1980). Meta-analysis of research on class size and its relation to attitudes and instruction. *American Educational Research Journal, 17,* 419–433.

Sofko, Jr. W.W. (1997) Evaluating the cost and benefit in Special Education. *Wildwood Institute*. Retrived June 4, 2013 from http://www.wildwood.edu/institute/knowledge/evaluating.html

Silverberg, Marsha, et al. (2002). *National assessment of vocational education: Interim report to Congress.* Washington: U.S. Department of Education, Office of the Undersecretary. Retrieved September 25, 2013 from http://www2.ed.gov/rschstat/eval/sectech/nave/interimreport.pdf

Stonge, J.H., Ward, T.J., & Grant, L.W. (2011). What makes good teachers good? A cross-case analysis of the connection between teacher effectiveness and student achievement. *Journal of Teacher Education, 62(4),* 339-355.

Taylor. C. (1998) Does money matter? An empirical study introducing resource costs and student needs into educational production function analysis. In U.S.

Department of Education. National Center for Education Statistics. *Developments in School Finance, 1997*.

Taylor, L. L. (2010). Economic approaches to school efficiency. In D. J. Brewer and P. J. McEwan (Eds.) *Economics of Education* (pp. 208-213). Academic Press: New York.

Templeton, I. (1972). *School size.* Washington, D.C.: National Center for Educational Research and Development. (ERIC Document Reproduction Service No. ED 072 505)

Texas Comptroller of Public Accounts. (2011). *Biennial revenue estimate 2012-2013 biennium: 82nd Texas legislature.* State of Texas, Austin, TX: Author.

Texas Const., Art. 7, § 1

Texas House Bill 3, 81st Leg., Reg. Sess., 2009.

Tremblay, P. (2013). Comparative outcomes of two instructional models for students with learning disabilities: Inclusion with co-teaching and solo-taught special education. *Journal of Research in Special Educational Needs.* doi: 10.1111/j.1471-3802.2012.01270.x

U.S. Census. (2007). *2006 Children characteristics, Texas*. Retrieved June 4, 2013, from http://factfinder.census.gov/servlet/STTable?_bm=y&-context=st&-qr_name=ACS_2006_EST_G00_S0901&-ds_name=ACS_2006_EST_G00_&-tree_id=306&-redoLog=false&-_caller=geoselect&-geo_id=04000US48&-format=&-_lang=en

Van Duyne, D. W. (2004). *The effects of extracurricular engagement on students' academic achievement* (Doctoral dissertation, Purdue University). Retrieved from ProQuest Dissertations and Theses.

Vignoles, A., Levacic, R., Walker, J., Machin, S. & Reynolds, D. (2000). The relationship between resource allocation and pupil attainment: A review. *Center for the Economics of Education.* Retrieved July 1, 2011 from: http://eprints.lse.ac.uk/19558/1/The_Relationship_between_Resource_Allocation_and_Pupil_Attainment_A_Review.pdf

Walberg, H. J., & Fowler Jr, W. J. (1987). Expenditure and size efficiencies of public school districts. *Educational Researcher*, *16*(7), 5-13.

Walters, J. J. (2006). *Funding Michigan K--12 Educational Adequacy Without Rewarding Inefficiency*. Retrieved from ProQuest Dissertation and Theses.

Webster, W. J., Mendro, R. L., & Almaguer, T. O. (1994). Effectiveness indices: A "value added" approach to measuring school effect. *Studies in Educational Evaluation, 20,* 113-145.

Wenglinsky, H. (1997) How Money Matters: The effect of school district spending on academic achievement. *Sociology of Education, 70(3),* 221-237.

Williams, T. T., & Sánchez, B. (2013). Identifying and Decreasing Barriers to Parent Involvement for Inner-City Parents. *Youth & Society*, *45*(1), 54-74.

Williamson, O. E. (1975) *Markets and Hierarchies.* Free Press: New York.

Winzer, M. (2009). *From integration to inclusion: A history of Special Education in the 20th century.* Washington, TX: Gallaudet University Press.